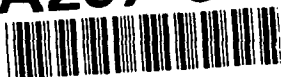


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FEDERAL SUPPORT FOR SOLAR ENERGY**

BY

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Chapter 1

INTRODUCTION

Early civilizations worshipped the sun and relied upon it as a source of energy. Later, with the discovery of oil and coal, man looked to a new deity, fossil fuel, and the sun's importance as an energy source began to wane.

Events in the last twenty years, however, indicate the sun is more important than ever as a future source of renewable energy. But, the development and commercial application of solar energy technologies¹ will never occur without the commitment of the American people and their elected representatives in Congress.

1.1 The United States Becomes Addicted To Oil

Not unlike the "junkie" hooked on heroin, the United States became addicted to fossil fuel, especially, oil. And as the heroin junkie who comes face-to-face with his addiction only when his drug supply is cut off, the United States would experience these same withdrawal pains.

Up until 1973, most Americans took energy for granted. By that year, domestic energy consumption had reached seventy-five quadrillion British

¹Solar energy is broadly defined to include technologies such as solar thermal, biomass, solar electric (photovoltaics), ocean thermal, windpower, and solar heating and cooling for buildings. Domestic Policy Review of Solar Energy - A Response Memorandum to the President of the United States, U.S. Department of Energy 1, i [hereinafter Domestic Policy Review].

thermal units (Btu's), more than double the Btu's consumed in 1950.² Though energy was being used at an alarming rate, the typical "Joe Citizen" never gave it a thought. Flip a switch and the lights come on; pull up to the corner Texaco and fill up the automobile with cheap gasoline. And without having to ask, the friendly gas station attendant would wash the windshield and offer the choice of a free tumbler or fuzzy dice!

Crude oil was a relatively inexpensive source for energy and there appeared to be little concern over the availability of future supplies until the mid-1960s, as through 1965 the United States was self-sufficient in its demand for oil.³ After 1965, however, importing oil was a necessity, not an option. But, this was an insignificant concern since the oil-producing nations on which the United States relied were more than willing to sell as much oil as needed.

By 1973, demand for oil in the United States had risen from 8.49 million barrels per day to 17.30 million barrels, an increase of 104%. During this same period, oil imports rose from 1.25 million barrels per day to 6.26 million barrels per day, an astounding 400% increase.⁴ The United States then suffered the consequences for its reliance on imported oil, as "the well went dry."

²H.R. Rep. No. 340, 94th Cong. 1st Sess. 2, reprinted in 1975 U.S. Code Cong. & Ad. News 1762, 1764.

³S. Rep. No. 141, 95th Cong., 2d Sess. 5, reprinted in 1978 U.S. Code Cong. & Ad. News 7659, 7674.

⁴S. Rep. No. 141, 95th Cong., 2d Sess. 6, reprinted in 1978 U.S. Code Cong. & Ad. News 7659, 7675.

1.2 Politics And Oil

In 1973, the Yom Kippur conflict erupted between Israel and its Arab neighbors in the Middle East. Israel, with the help of American-supplied military equipment and intelligence, was overwhelmingly victorious. As a result of its alliance with Israel, the United States was punished by the Organization of Petroleum Exporting Countries (OPEC). OPEC initiated an embargo of its oil⁵ which affected the life of all Americans and most of the world.

With gasoline in short supply and prices for it soaring, long waits at filling stations and flaring tempers were the norm. Though the oil embargo was an inconvenience for all, for some it was a near disaster. Impacts on the economy, which was already in a slump, were profound.⁶ Due to the ailing economy, businesses and industries were forced to cut back and unemployment skyrocketed.⁷

1.3 Federal Support Of Solar Energy Research And Development

It is said every cloud has a silver lining and the OPEC oil embargo had one, also. After experiencing economic blackmail, the federal

⁵Resulting in a 2.2 million barrel-per-day reduction in imports of crude oil and petroleum products. H.R. Rep. No. 340, 94th Cong., 1st Sess. 20, reprinted in 1975 U.S. Code Cong. & Ad. News 1762, 1782.

⁶For the first quarter of 1974, the Gross National Product decreased by 7%. Id.

⁷For the first quarter of 1974, unemployment rose by over 400,000 persons. Id.

government began to perceive fossil fuel in a different light. No longer was it taken for granted as an unlimited energy source. Nor could shortfalls in the domestic production of oil be compensated for by imports unless the exporting nation was friendly with the United States. Therefore, the only way the United States could insulate itself from future energy shortages was to become energy self-sufficient. This required the development of alternative energy sources to oil. Solar energy and other renewables⁸ appeared to be the solution.

Prior to 1973, there was little reason for a concerted effort to develop alternatives to fossil fuel and federal support of solar energy was practically nonexistent.⁹ At this time, solar energy matters were under the direction of the National Science Foundation (NSF), but the NSF was only engaged in research, not technology development.¹⁰ However, with the OPEC oil embargo as a catalyst, the 93rd Congress enacted the first solar energy legislation in 1974 which gave birth to the federal

⁸Solar energy is a subset of renewable energy. Renewable energy is defined more broadly to include non-solar technologies such as geothermal and hydropower energy systems. Geothermal systems utilize heat stored in geologic formations for fuel, electricity or heat. The most common type of geothermal technology is hydrothermal, which uses high-temperature fluids from the earth to drive turbines for electricity production. Energy Security - A Report to the President of the United States, U.S. Department of Energy 1, 203 (March 1987) [hereinafter Energy Security]. Hydropower is the oldest form of electricity production and uses the energy produced by moving water to power turbines. Hydropower produces more electricity than any other renewable energy source. Conservation and Renewable Energy Technologies for Utilities, U.S. Department of Energy 1, 25 (April 1992).

⁹Solar energy was viewed as a futuristic energy option with possible applications for the space program. Sklar, The Role of the Federal Government in the Commercialization of Renewable Energy Technologies, 15 Annual Energy Review 121, 122 (1990).

¹⁰Id. at 123.

solar energy research and development (R&D) program.

Though the advancement of solar energy technologies was now of federal interest, it had yet to become a serious commitment. This was to change, however, under the Carter Administration, as solar energy R&D became an integral facet of federal energy policy.

Often one's commitment to a principle is measured by the adage of "put your money where your mouth is." If this same challenge is applied to the federal government regarding solar energy, at times it would appear as if the depth of its commitment was extremely shallow (or even nonexistent). The annual federal budgets for solar energy R&D, if plotted on a graph, resemble a rollercoaster track.

Federal solar energy R&D funding, which was extremely limited in Fiscal Year (FY) 1974, began a steady climb which peaked in FY 1981. However, with the election of President Reagan, his Administration's decidedly different attitude toward solar energy started a downward spiral of federal solar energy funding. By the end of his eight years in office, the federal solar budget would almost hit "rock bottom."

After being devastated by the policies of the Reagan Administration, the federal solar energy program began a slow recovery under President Bush. And now, with the election of President Clinton, the political winds appear more favorable than ever for solar energy to become a viable alternative to fossil fuel.

Chapter 2

BEFORE THE DAWN OF THE SOLAR AGE

"Sun Day," May 3, 1978, is considered as the beginning of the federal solar movement by many solar energy advocates. However, prior to that date, the federal government had already "warmed up" to the importance of this energy source as an alternative to oil due to the impact of the OPEC oil embargo.

Prior to the OPEC oil embargo, solar energy received little interest from most Americans. Those persons who preached the importance of solar energy were looked on as zealots and they wielded little political influence. This lack of interest by the nation as a whole was reflected in the federal solar energy R&D budget for FY 1974. At that time, it totalled¹¹ a miniscule \$15 million.¹²

Though solar energy bills were introduced as early as 1951, no such legislation was enacted until the 93rd Congress (1973-74).¹³ However, once it was realized the United States could be held hostage over a barrel of oil, Congress finally began to demonstrate an interest in solar energy issues. Additionally, a group of young staffers who viewed solar energy as the panacea for the nation's energy woes formed the Congressional Solar Coalition. These staffers generated much of the pro-solar activity within

¹¹Solar energy R&D budgets have been rounded off to the nearest million.

¹²Domestic Policy Review, supra note 1, at 8.

¹³Dawkins and Troutman, Solar Energy Legislation in the 95th Congress, 1 Solar Law Reporter 139, 139 (May/June 1979).

Congress during the early years of the solar energy movement.¹⁴

2.1 Solar Energy Legislation During The 93rd Congress

The 93rd Congress was very active in promoting solar energy technologies. Pro-solar legislation included the Solar Heating and Cooling Demonstration Act of 1974,¹⁵ the Energy Reorganization Act of 1974,¹⁶ the Solar Energy Research, Development and Demonstration Act of 1974,¹⁷ and the Federal Nonnuclear Energy Research and Development Act of 1974.¹⁸

The 93rd Congress enacted the Solar Heating and Cooling Demonstration Act of 1974¹⁹ with the realization that the 1973 OPEC oil embargo had

¹⁴Sklar, supra note 10, at 123.

¹⁵P.L. 93-409, 88 Stat. 1069 (1974).

¹⁶P.L. 93-438, 88 Stat. 1233 (1974).

¹⁷P.L. 93-473, 88 Stat. 1431 (1974).

¹⁸P.L. 93-577, 88 Stat. 1878 (1974).

¹⁹Solar heating and cooling encompasses both "active" and "passive" systems. Active solar heating systems use collectors to absorb the sun's radiant energy, then fans or pumps are used to distribute the heat throughout the building. Lof, Active Heating, Assessment of Solar Technologies 3, 3 (n.d.). Passive solar heating systems employ architectural designs which maximize natural energy flows and minimize dependence on conventional energy sources and mechanical equipment. Elements of the building collect, store and distribute the solar heat. FY 1981 Solar Energy Program Summary Document, U.S. Department of Energy 1, 20. Active solar cooling systems use a solar-heated boiler with an absorption cooler. The cooled air is then mechanically-distributed throughout the building. Penney, Active Cooling, Assessment of Solar Technologies 6, 6-7 (n.d.). Passive solar cooling relies on incorporating heat-avoidance techniques, natural lighting, and natural cooling methods into a building's design. Natural cooling methods use ventilation, night cooling, earth contact cooling and evaporation cooling. Sheinkopf, Passive Cooling, Assessment of Solar Technologies 11, 11 (n.d.).

altered the economics of energy by increased oil prices and decreased supplies.²⁰ The act established a five year, \$600 million program to provide for major demonstrations of solar heating technologies in residential and commercial buildings by 1977 and cooling technologies by 1979.²¹ Under this act, the National Aeronautics and Space Administration was responsible for the research, development and manufacture of solar heating and cooling equipment.²² Performance criteria for the equipment was the responsibility of the Department of Housing and Urban Development (HUD).²³ Once manufactured, the solar energy equipment was installed in residential buildings by HUD²⁴ and by the Department of Defense in military dwellings²⁵ during the demonstration phase.

The Energy Reorganization Act of 1974 created the Energy Research and Development Administration (ERDA).²⁶ ERDA's purpose was to consolidate the nation's fragmented and uncoordinated energy R&D functions and to

²⁰S. Rep. No. 734, 93rd Cong., 2d Sess. 2, reprinted in 1974 U.S. Code Cong. & Ad. News 5196, 5197.

²¹Solar Heating and Cooling Act of 1974, Public Law 93-409, Statutes and Legislative Histories, Vol. 1. Printed by the Committee on Science and Technology, U.S. House of Representatives (April 1978).

²²P.L. 93-409, § 4, 88 Stat. 1070 (1974), 42 U.S.C. § 2473(b).

²³P.L. 93-409, § 5, 88 Stat. 1070 (1974), 42 U.S.C. § 5503(b)(1).

²⁴P.L. 93-409, § 6, 88 Stat. 1072 (1974), 42 U.S.C. § 5504(e).

²⁵P.L. 93-409, § 6, 88 Stat. 1072 (1974), 42 U.S.C. § 5504(f).

²⁶P.L. 93-438, Title I, § 101, 88 Stat. 1234 (1974), 42 U.S.C. § 5811.

develop the technologies necessary for energy self-sufficiency by 1984.²⁷

The purpose of the Solar Energy Research, Development and Demonstration Act of 1974 was to advance solar energy technologies by implementing an aggressive and comprehensive program with the financial support required to make widespread use of solar energy practical.²⁸ Solar energy was viewed not as a curiosity, but a viable energy option which could provide 10% to 30% of the United States' energy needs by 2000.²⁹

Congress enacted the Solar Energy Research, Development and Demonstration Act of 1974 based on findings that (1) society required an ample supply of energy and nonrenewable energy sources would not last forever; (2) renewable energy sources, such as solar energy, should be developed; (3) solar energy technologies were at widely different stages of development; (4) solar energy R&D has been extremely limited; and (5) use of solar energy could make the United States less dependent on foreign energy sources.³⁰ Solar energy technologies covered by the act

²⁷S. Rep. No. 980, 93rd Cong., 2d Sess. 1-2, reprinted in 1974 U.S. Code Cong. & Ad. News 5470, 5470-71.

²⁸S. Rep. No. 1151, 93rd Cong., 2d Sess. 1, reprinted in 1974 U.S. Code Cong. & Ad. News 5915, 5915.

²⁹S. Rep. No. 1151, 93rd Cong., 2d Sess. 4, reprinted in 1974 U.S. Code Cong. & Ad. News 5915, 5918.

³⁰P.L. 93-473, § 2, 88 Stat. 1431 (1974), 42 U.S.C. § 5551(a).

included solar heat for industrial purposes, solar thermal,³¹ biomass, photovoltaics, ocean thermal and wind energy systems.³² Solar energy programs were administered by the Solar Energy Coordination and Management Project (Project), a coalition of federal agencies.³³ All functions of the Project were transferred to the Energy Research and Development Administration after its creation.³⁴ In addition, the act established the Solar Energy Research Institute to perform solar energy R&D in support of the act's objectives.³⁵

The Federal Nonnuclear Research and Development Act of 1974 required the Administrator of ERDA to demonstrate the commercial viability of solar technologies developed under programs established by the Solar Heating and Cooling Demonstration Act of 1974.³⁶ Congress wanted to ensure that solar R&D did not emphasize refinement of scientific knowledge while ignoring the "massive problems and costs of full-scale [technology] application."³⁷ Under the act, federal assistance encompassed loans for

³¹Solar thermal energy systems can generate heat or electricity. This technology either uses solar ponds heated by the sun or mirrors to redirect the sun's radiant energy into a central collector. Vant-Hull, Solar Thermal, Assessment of Solar Technologies 17, 17 (n.d.).

³²S. Rep. No. 1151, 93rd Cong., 2d Sess. 5, reprinted in 1974 U.S. Code Cong. & Ad. News 5915, 5919.

³³P.L. 93-473, § 4, 88 Stat. 1432 (1974), 42 U.S.C. § 5553.

³⁴S. Rep. No. 1151, 93rd Cong., 2d Sess. 5, reprinted in 1975 U.S. Code Cong. & Ad. News 5915, 5919.

³⁵P.L. 93-473, § 10, 88 Stat. 1432 (1974), 42 U.S.C. § 5559.

³⁶P.L. 93-577, § 3, 88 Stat. 1879 (1974), 42 U.S.C. § 5902(b)(3).

³⁷S. Rep. No. 589, 93rd Cong. 2d Sess. 5, reprinted in 1974 U.S. Code Cong. & Ad. News 6861, 6865.

demonstration projects, joint federal/private industrial projects, construction of federally-owned facilities and financial awards to inventors of new solar energy technologies.³⁸

2.2 The Evolution Of A National Solar Energy Program

In order to achieve energy self-sufficiency, the Energy Research and Development Administration began to formulate a national solar energy strategy which depended on a close working relationship with private industry to develop economically-competitive and environmentally-sound solar energy systems. ERDA's interest in solar energy was immediately reflected in the federal solar energy R&D budget. For FY 1975, it increased to 54 million,³⁹ a 260% increase over FY 1974's solar budget.

In 1974, it was believed solar energy could provide up to 25% of the nation's energy needs by 2020. However, it was recognized that in order to achieve this goal, the cost of collecting and utilizing solar energy had to be dramatically reduced.⁴⁰ If solar energy costs became competitive, ERDA viewed solar energy as having the potential to significantly contribute to the nation's progress toward energy independence by (1) increased use of this inexhaustible energy source; (2) efficient transformation of fuel resources into more desirable forms; (3) transforming energy use patterns to improve energy utilization; and

³⁸P.L. 93-577, § 7, 88 Stat. 1883 (1974), 42 U.S.C. § 5906(a).

³⁹Domestic Policy Review, *supra* note 1, at 8.

⁴⁰Definition Report - National Solar Energy Research, Development & Demonstration Program, Energy Research and Development Administration 1, 1 (June 1975).

(4) protecting and enhancing the general health, safety, welfare and environment related to energy.⁴¹

In 1976, ERDA contracted with the Stanford Research Institute (SRI) to conduct a study on the implications of the development and commercialization of solar energy technologies. SRI concluded that oil prices would continue to rise until solar energy became cost competitive.⁴² In addition, SRI blamed the fact that solar energy was not yet a viable energy alternative on "nearsighted economics" - it was cheaper to use fossil fuel than fund R&D programs for solar energy utilization.⁴³ According to the Stanford Research Institute, in order for solar energy technologies to compete on an equal footing with fossil fuels, federal solar energy R&D funding had to be increased. Further, the federal government must be prepared to subsidize solar energy and, at the same time, reduce its current subsidies for fossil fuel energy sources.⁴⁴

Though the federal budget for solar energy R&D may not have been at a level to satisfy SRI and other solar energy advocates, it was evident

⁴¹Id.

⁴²Solar Energy in America's Future - A Preliminary Assessment, Stanford Research Institute 1, 71 (March 1977). This conclusion was based on the dramatic increase in oil prices brought about by the OPEC embargo. In January 1973, imported oil cost an average of \$2.77 per barrel and domestic oil \$3.00 per barrel. By 1975, price per barrel had risen to \$12.63 and \$11.28, respectively. H.R. Rep. No. 340, 94th Cong., 1st Sess. 38, reprinted in 1975 U.S. Code Cong. & Ad. News 1762, 1800.

⁴³Solar Energy in America's Future - A Preliminary Assessment, supra note 43, at 71.

⁴⁴Id. at 73-74.

great progress was being made. For FY 1976, the solar R&D budget rose to \$152 million.⁴⁵ By FY 1977, it was \$313 million.⁴⁶

2.3 Solar Energy Legislation During The 94th Congress

In the 94th Congress (1975-76), 55 solar energy bills were introduced, including 42 that provided for financial incentives. None of the financial incentives were enacted.⁴⁷ However, the 94th Congress did enact the Energy Conservation and Production Act⁴⁸ and the Electric and Hybrid Vehicle Research, Development, and Demonstration Act of 1976.⁴⁹

The Energy Conservation and Production Act provided funding for the Federal Energy Administration (FEA)⁵⁰ through the end of FY 1977.⁵¹ Funding was authorized for commercial applications of solar

⁴⁵Domestic Policy Review, *supra* note 1, at 8.

⁴⁶Id.

⁴⁷Dawkins and Troutman, *supra* note 14, at 140.

⁴⁸P.L. 94-385, 90 Stat. 1125 (1976).

⁴⁹P.L. 94-413, 90 Stat. 1260 (1976).

⁵⁰Created by the Federal Energy Administration Act of 1974, P.L. 93-275, 88 Stat. 96 (1974). The FEA, along with ERDA, was one of two new energy organizations within the federal government to provide central policy and management direction in energy affairs. ERDA was primarily responsible for R&D, while the FEA developed broad strategies for dealing with energy shortages and energy policy implementation. H.R. Rep. No. 748, 93rd Cong., 2d Sess. 5-15, reprinted in 1974 U.S. Code Cong. & Ad. News 2939, 2943-2953.

⁵¹H.R. Rep. No. 1113, 94th Cong., 2d Sess. 8, reprinted in 1976 U.S. Code Cong. & Ad. News 2005, 2011-12.

technologies,⁵² but not additional R&D.⁵³ Congress believed adequate solar energy research had already been conducted, but an incentive was required for its practical, commercial utilization.⁵⁴

The Electric and Hybrid Vehicle Research, Development, and Demonstration Act of 1976 declared a policy for the United States to demonstrate the commercial feasibility of such vehicles⁵⁵ in order to conserve oil and reduce environmental pollution.⁵⁶ The act mandated a five year, \$160 million program⁵⁷ to place more than 7,500 electric vehicles into use for personal and business travel.⁵⁸ In order to encourage the manufacture of electric vehicles, ERDA was authorized to guarantee lenders against loss of principal or loans made to electric vehicle manufacturers.⁵⁹

⁵²P.L. 94-385, Title I, § 110, 90 Stat. 1130 (1977), 15 U.S.C. § 761(a)(7).

⁵³P.L. 94-385, Title I, § 110, 90 Stat. 1130 (1976), 15 U.S.C. § 761(c).

⁵⁴H.R. Rep. No. 1113, 94th Cong., 2d Sess. 15, reprinted in 1976 U.S. Code Cong. & Ad. News 2005, 2019.

⁵⁵At the turn of the 20th century, electric vehicles were more common than gasoline-powered ones. H.R. Rep. No. 439, 94th Cong., 2d Sess. 13, reprinted in 1976 U.S. Code Cong. & Ad. News 2315, 2316.

⁵⁶Id.

⁵⁷P.L. 94-413, § 16, 90 Stat. 1270 (1976), 15 U.S.C. § 2514(a).

⁵⁸P.L. 94-413, § 7, 90 Stat. 1263 (1976), 15 U.S.C. § 2506(c)(3).

⁵⁹P.L. 94-413, § 10, 90 Stat. 1267 (1976), 15 U.S.C. § 2509(3)(1).

2.4 Solar Energy Legislation During The 95th Congress

The 95th Congress (1977-78) was responsible for the greatest increase in solar energy legislation. By this time, the Congressional Solar Coalition had been bolstered by the inclusion of ninety-five members of Congress who were dedicated to the advancement of solar energy technologies.⁶⁰

Initially, the 95th Congress did little to advance the cause of solar energy. However, in mid-1977, the 95th Congress enacted the National Energy Extension Service Act⁶¹ and the Department of Energy (DOE) Organization Act.⁶²

The National Energy Extension Service Act established a national Energy Extension Service to encourage small energy consumers to convert to renewable energy sources based upon programs designed by the states.⁶³ These programs emphasize technical assistance, instruction, information and practical demonstrations.⁶⁴ State programs required approval⁶⁵ by the Energy Extension Service,⁶⁶ a DOE office which ensured compliance with national energy objectives.

⁶⁰Dawkins and Troutman, supra note 14, at 140.

⁶¹P.L. 95-39, 91 Stat. 191 (1977).

⁶²P.L. 95-91, 91 Stat. 565 (1977).

⁶³H.R. Rep. No. 224, 95th Cong., 1st Sess. 37, reprinted in 1977 U.S. Code Cong. & Ad. News 312, 312.

⁶⁴P.L. 95-39, Title V, § 505, 91 Stat. 193 (1977), 42 U.S.C. § 7004(a).

⁶⁵P.L. 95-39, Title V, § 506, 91 Stat. 195 (1977), 42 U.S.C. § 7005(d).

⁶⁶P.L. 95-39, Title V, § 503, 91 Stat. 192 (1977), 42 U.S.C. § 7002.

The Department of Energy Organization Act established the Department of Energy.⁶⁷ DOE was required to "place major emphasis on the development and commercialization of solar, geothermal, recycling and other technologies utilizing renewable energy resources."⁶⁸ Creation of the Department of Energy was of great significance to the overall national energy policy as well, for there had not been a single agency responsible and accountable for developing a comprehensive national energy policy. Heretofore, the Federal Energy Administration, the Energy Research and Development Administration, the Department of the Interior and the Federal Power Commission all administered pieces of the national energy pie.⁶⁹ Having so many agencies with independent authority attempting to implement national energy policy resulted in unnecessary duplication of programs.⁷⁰ In addition, the Department of Energy Organization Act established the Federal Energy Regulatory Commission (FERC).⁷¹ FERC is responsible for ensuring economic regulatory decisions are consistent with the nation's overall energy policies.⁷²

⁶⁷P.L. 95-91, Title II, § 201, 91 Stat. 569 (1977), 42 U.S.C. § 7131.

⁶⁸Principal Energy Research and Development Legislation Through the 95th Congress, House Committee on Science and Technology Subcommittee on Fossil and Nuclear Energy Research, Development and Demonstration 1, 4 (December 1978).

⁶⁹S. Rep. No. 164, 95th Cong., 1st Sess. 3-4, reprinted in 1977 U.S. Code Cong. & Ad. News 854, 856-57.

⁷⁰S. Rep. No. 164, 95th Cong., 1st Sess. 4-5, reprinted in 1977 U.S. Code Cong. & Ad. News 854, 858.

⁷¹P.L. 95-91, Title IV, § 401, 91 Stat. 582 (1977), 42 U.S.C. § 7171.

⁷²FERC was created to administer the principal pricing and related regulatory functions transferred to the Department of Energy from the Federal Power Commission, Federal Energy Administration and the Interstate Commerce Commission. S. Rep. No. 164, 95th Cong., 1st Sess. 36, reprinted

Chapter 3

INTEREST IN SOLAR ENERGY HEATS UP

Solar energy advocates believed that the election of President Carter in 1976 would be a dramatic boost for the development of solar energy technologies. Unlike Presidents Nixon and Ford, Carter had a keen interest in solar energy.⁷³ In fact, on Inauguration Day he was sworn in as the thirty-ninth President while standing on a solar-heated reviewing stand.⁷⁴ However, expectations of the Carter Administration making an immediate impact on federal support of solar energy were initially unmet.

3.1 President Carter's Solar Energy Baptism

The first Department of Energy solar energy R&D budget request under the Carter Administration for FY 1978 was identical to the Ford Administration's FY 1977 budget request.⁷⁵ Any hopes that this failure to substantially increase the federal solar energy R&D budget was merely a temporary setback were misplaced. DOE's FY 1979 solar budget request was

in 1977 U.S. Code Cong. & Ad. News 854, 890.

⁷³Interview with Scott Sklar, Executive Director of the Solar Energy Industries Association, in Washington, D.C. (August 6, 1991).

⁷⁴Frankel, Technology, Politics and Ideology: The Vicissitudes of Federal Solar Energy Policy, 1973-1983. House of Representatives Science and Technology Committee 1, 25-26 (January 11, 1984).

⁷⁵Metz and Hammond, Strategies of Research: Making Solar After the Nuclear Model, Solar Energy in America 1, 7 (1978).

less than the previous year's FY 1978 appropriation of \$444 million.⁷⁶

Something had to be done to reenergize the solar energy movement and, perhaps, to prod the federal government into action. This "something" was Sun Day.

On May 3, 1978, millions of Americans and people in thirty-five other countries celebrated Sun Day, the so-called "dawn of the solar age."⁷⁷ On this day, while speaking at the dedication of the Solar Energy Research Institute at Golden, Colorado, President Carter announced a \$100 million supplemental budget request for FY 1979 solar energy R&D. In addition, he stated a multi-agency task force had been formed "to review, analyze, and accelerate solar energy development in the United States."⁷⁸ This task force, the Solar Energy Policy Committee, would be under the chairmanship of the Secretary of Energy.⁷⁹

3.2 The Domestic Policy Review

The culmination of the Solar Energy Policy Committee's efforts was the Domestic Policy Review (DPR). Over 100 officials from more than thirty executive departments and agencies participated in this process which examined the current status of solar energy within the United States. In addition, twelve regional public meetings were convened across the nation

⁷⁶Id.

⁷⁷Caughlin, A Government Solar Report, 5 EPA J. 30, 30 (April 1977).

⁷⁸Frankel, supra note 75, at 27.

⁷⁹Id.

to receive comments and recommendations on the development of a federal solar energy policy. All the information gathered from the regional meetings was used by the Solar Energy Policy Committee in forming a national consensus on solar energy.⁸⁰

At this time, interest in solar energy was at an all-time high. Polls indicated that although alternative energy sources to fossil fuel were usually met with skepticism, 94% of the American public favored rapid development of solar energy.⁸¹ However, it was widely held that if solar energy was to become a viable alternative energy source, the federal government must become more involved in its development.⁸²

The Domestic Policy Review resulted in nine major findings that would shape the future of federal involvement in solar energy R&D:

(1) Significant potential exists for increased use of solar energy and other renewables. In 1979, 6% of the nation's energy supply was generated from solar energy and hydropower.⁸³

(2) Solar energy does not have the detrimental environmental impacts of fossil fuel and increased use of solar energy would add diversity and

⁸⁰Domestic Policy Review, supra note 1, at i.

⁸¹Hayes, Toward a Solar America, 5 EPA J. 25, 25 (April 1979).

⁸²Id. at 25-26.

⁸³In 1979, the United States consumed 80 quads (a quad is one quadrillion Btu's) of energy. Solar energy and hydropower contributed 4.8 quads. Domestic Policy Review, supra note 1, at ii.

flexibility to the nation's energy supply.⁸⁴

(3) Increased use of solar energy would lessen the dependence of the United States on foreign oil imports, thereby resulting in greater energy self-sufficiency and a reduction in the balance of trade deficit.⁸⁵ In addition, foreign policy would become more flexible.⁸⁶

(4) Many solar energy technologies are already economically competitive with conventional technologies.⁸⁷

(5) If the public received more education on solar energy, they would have more confidence in it (equating to more use) as an alternative energy source.⁸⁸

(6) The market system fails to consider the full social benefits of using solar energy technologies, such as the costs of air and water pollution by conventional energy sources.⁸⁹

(7) Solar energy technologies cannot compete with conventional technologies due to federal subsidies and price controls for fossil

⁸⁴Id. at iii.

⁸⁵Id. at vi.

⁸⁶Id. An argument that appears even more persuasive today since the involvement of the United States in Desert Storm/Desert Shield after the invasion of Kuwait by Iraq. Many critics of this military operation allege it was prompted by the need to protect a source of imported oil, not out of concern for the sovereignty of Kuwait.

⁸⁷Id. at iii-iv.

⁸⁸Id. at iv.

⁸⁹Id.

fuels.⁹⁰

(8) Federal energy policy should be shaped by national energy goals.⁹¹

(9) Federal government leadership in advancing solar energy development could foster increased state involvement.⁹²

Based on these findings, the Domestic Policy Review proposed three potential scenarios for a federal solar energy program - the Base Case, the Maximum Practical Case and the Technical Limits Case. The Base Case assumed the federal solar energy program would stay as is, with no new solar energy initiatives. The Maximum Practical Case would expand the current level of federal effort with programs targeted to accomplish specific cost-effective objectives. The Technical Limits Case, if adopted, would implement an all-out national solar energy mobilization reflecting solar energy development as a high national priority.⁹³

The DPR recommended that the Carter Administration establish a federal solar energy program analogous to the Maximum Practical Case. This would achieve the goal of solar energy and other renewables supplying 20% of the nation's energy needs by 2000.⁹⁴ This recommendation, which was ultimately adopted, represented a compromise between what was minimally

⁹⁰Id. at v.

⁹¹Id. at v-vi.

⁹²Id. at vi.

⁹³Id. at 23-24.

⁹⁴FY 1981 Solar Energy Program Summary Document, supra note 20, at 8.

acceptable to solar advocates and what the conservatives in the Carter Administration would support.⁹⁵

As will be seen, this 20% goal⁹⁶ was never met. Perhaps the DPR was unrealistic in setting the solar energy goal so high, as historically new energy sources have taken up to fifty years to make significant energy contributions.⁹⁷ But the real problem may have been systemic disinterest by federal decision-makers in attempting to reach this goal. Indeed, an Office of Technology Assessment study found that the solar energy programs which were ultimately established were understaffed and exhibited "a pervasive belief within and outside DOE that senior DOE management does not really care [about the programs]."⁹⁸

3.3 The 95th Congress Enacts The National Energy Act

On April 20, 1977, President Carter submitted his National Energy Plan to Congress and subsequently proposed a National Energy Act,⁹⁹ which Congress enacted on November 9, 1978.

⁹⁵Frankel, supra note 75, at 29.

⁹⁶The 20% goal was premised on the assumption that oil prices would continue to rise and ultimately reach \$25-\$32 per barrel (in 1977 dollars) by 2000. Domestic Policy Review, supra note 1, at ii-iii. The passage of time would show this assumption was erroneous. Currently, the approximate price of imported/domestic oil is \$18 per barrel. Anchorage Daily News, April 30, 1993, at E4.

⁹⁷FY 1981 Solar Energy Program Summary Document, supra note 20, at 8.

⁹⁸Conservation and Solar Energy Programs of the Department of Energy: A Critique, Office of Technology Assessment 1, 4 (1980).

⁹⁹H.R. 6831, 95th Cong., 1st Sess., 123 Cong. Rec. H3905 (1977).

The National Energy Act (NEA) was actually a conglomeration of five different acts¹⁰⁰ - the Energy Tax Act of 1978,¹⁰¹ the Public Utility Regulatory Policies Act (PURPA) of 1978,¹⁰² the Powerplant and Industrial Fuel Use Act of 1978 (PIFUA),¹⁰³ the Natural Gas Policy Act of 1978,¹⁰⁴ and the National Energy Conservation Policy Act.¹⁰⁵

The purpose of the National Energy Act was to reduce the growth of energy demand, decrease oil imports, increase natural gas supplies, and encourage the use of coal and renewable energy sources.¹⁰⁶ The National Energy Act was very important to the commercialization of solar energy technologies by (1) fostering greater public awareness about the practicality of solar energy; (2) encouraging installation of solar devices in homes, public buildings and industrial applications; and (3) improving the economic competitiveness of solar technologies.¹⁰⁷

¹⁰⁰The House of Representatives enacted the National Energy Act without major changes on August 5, 1977. The Senate, however, divided the NEA into five separate acts and the individual committees were lobbied extensively by industry, utility, environmental and other interested groups. Dawkins and Troutman, supra note 14, at 141.

¹⁰¹P.L. 95-618, 92 Stat. 3174 (1978).

¹⁰²P.L. 95-617, 92 Stat. 3117 (1978).

¹⁰³P.L. 95-620, 92 Stat. 3289 (1978).

¹⁰⁴P.L. 95-621, 92 Stat. 3350 (1978).

¹⁰⁵P.L. 95-619, 92 Stat. 3206 (1978).

¹⁰⁶H.R. 6831, 95th Cong., 1st Sess. § 2, 123 Cong. Rec. 3905 (1977).

¹⁰⁷Howard, The National Energy Act Statutes and Solar Energy, Solar Energy Research Institute 1, v (February 1980).

The Energy Tax Act of 1978 provided tax credits to residential and business users of solar energy systems. Residential users were given an income tax credit¹⁰⁸ for the installation of solar energy applications at 30% of the first \$2,000 and 20% of the next \$8,000, with a maximum tax credit of \$2,200.¹⁰⁹ The tax credit applied to passive,¹¹⁰ as well as active¹¹¹ energy systems.¹¹² The residential tax credit was to expire on December 31, 1985. This was the first federal tax incentive to promote the use of solar energy technologies.¹¹³ For business and industrial users, the act established a 10% investment tax credit for business and industrial users who installed solar energy systems.¹¹⁴ The investment tax credit was to expire on December 31, 1982.

PURPA's contribution to the advancement of solar energy technologies is its mandate that qualifying small energy producers be permitted to

¹⁰⁸P.L. 95-618, Title I, § 101(a), 92 Stat. 3175 (1978), codified in Internal Revenue Code § 44C(b), 26 U.S.C. § 44C(b).

¹⁰⁹For example, a homeowner who spent \$4,000 installing a solar hot water heater earned a tax credit of \$1,000.

¹¹⁰A "passive" system is based on conductive, convective or radiant heat transfer, such as use of a solar furnace which adds heat to a building.

¹¹¹An "active" system is based on mechanically-forced energy transfer, such as use of fans to circulate solar-generated heat.

¹¹²H.R. Rep. No. 1773, 95th Cong., 2d Sess. 44, reprinted in 1978 U.S. Code Cong. & Ad. News 7855, 8074.

¹¹³Comment, The Windfall Profit Tax Act and Taxpayer Double Dipping, 2 Solar Law Reporter 571, 571 (Sep/Oct 1980).

¹¹⁴P.L. 95-618, Title III, § 301(a), 92 Stat. 3194 (1978), amending Internal Revenue Code § 46(a), 26 U.S.C. § 46(a)(2).

connect with the transmission lines of utilities.¹¹⁵ Thus, small energy generators (such as those powered with solar energy systems) would have an assured market to sell their excess energy to the utilities.

Indirectly affecting the use of solar energy technologies were the Powerplant and Industrial Fuel Use Act of 1978 and the Natural Gas Policy Act of 1978. PIFUA discouraged the use of natural gas and oil in new electric powerplants¹¹⁶ and new major fuel-burning installations.¹¹⁷ The primary result of this legislation was a greater incentive to use coal. However, powerplants could burn natural gas or oil for energy production if combined with an "alternate fuel,"¹¹⁸ such as solar energy.¹¹⁹

The Natural Gas Policy Act of 1978 phased out the price ceilings on certain categories of natural gas.¹²⁰ This deregulation would ultimately raise the cost of natural gas and result in solar energy becoming more economically competitive.¹²¹

The National Energy Conservation Policy Act authorized dollar-for-dollar federal matching funds to schools and hospitals for the

¹¹⁵P.L. 95-617, Title II, § 202, 95 Stat. 3135 (1978), 16 U.S.C. § 824i.

¹¹⁶P.L. 95-620, Title II, § 201, 92 Stat. 3298 (1978), 42 U.S.C. § 8311.

¹¹⁷P.L. 95-620, Title II, § 202, 92 Stat. 3298 (1978), 42 U.S.C. § 8312.

¹¹⁸P.L. 95-620, Title II, § 212, 92 Stat. 3300 (1978), 42 U.S.C. § 8322(d).

¹¹⁹Howard, supra note 109, at v.

¹²⁰P.L. 95-621, Title I, § 121, 92 Stat. 3369 (1978), 15 U.S.C. § 3331.

¹²¹Dawkins and Troutman, supra note 14, at 143.

installation of solar heating and cooling systems.¹²² It also increased HUD and Federal Housing Administration (FHA) guaranteed mortgage limits by 20% to cover the increased costs of solar energy systems.¹²³ Further, the act required the installation of solar heating and cooling systems in federal buildings¹²⁴ over a two year period at a cost of \$100 million through FY 1980.¹²⁵ And to encourage the development of a domestic photovoltaic industry, Title V, Part 4¹²⁶ accelerated the procurement and use of solar cell energy systems at federal installations.¹²⁷

Though not having the grandiose impact of the National Energy Act, the 95th Congress also enacted other significant solar energy legislation, the Small Business Energy Loan Act¹²⁸ and the Solar Photovoltaic Energy

¹²²P.L. 95-619, Title III, § 302(a), 92 Stat. 3245 (1978), 42 U.S.C. § 6371e.

¹²³P.L. 95-619, Title II, § 248(a), 92 Stat. 3235 (1978), 12 U.S.C. § 1709(b)(2).

¹²⁴P.L. 95-619, Title V, § 522, 92 Stat. 3276 (1978), 42 U.S.C. § 8244. All executive agencies were to participate in this program. Each agency was required to submit proposals to DOE for installation of solar energy systems in select buildings under their control. S. Rep. No. 351, 95th Cong., 2d Sess. 120, reprinted in 1978 U.S. Code Cong. & Ad. News 8114, 8164.

¹²⁵P.L. 95-619, Title V, § 524, 92 Stat. 3277 (1978), 42 U.S.C. § 8244.

¹²⁶P.L. 95-619, Title V, 92 Stat. 3280 (1978). May be cited as the Federal Photovoltaic Utilization Act.

¹²⁷P.L. 95-619, Title V, § 565, 92 Stat. 3281 (1978), 42 U.S.C. § 8274.

¹²⁸P.L. 95-315, 92 Stat. 377 (1978).

Research, Development, and Demonstration Act of 1978.¹²⁹

The Small Business Energy Loan Act authorized the manufacturers and distributors of solar energy systems to receive up to \$500,000 in federal loan guarantees and up to \$350,000 in direct loans from the Small Business Association.¹³⁰ Due to the uncertainty of the solar energy market, the Small Business Association would assume a greater risk in making these loans.¹³¹

The purpose of the Solar Photovoltaic Energy Research, Development, and Demonstration Act of 1978¹³² was to establish an aggressive national program promoting commercial applications of solar photovoltaic cells which would be economically competitive with electricity generated from conventional energy sources, such as coal and oil.¹³³ Solar photovoltaic cells had been in existence for over twenty years and the cost of electricity produced from this technology had decreased from \$200 per peak

¹²⁹P.L. 95-590, 92 Stat. 2513 (1978).

¹³⁰P.L. 95-315, § 2, 92 Stat. 377 (1978), 15 U.S.C. § 636(1).

¹³¹Normally, the Small Business Association makes loans based on a "sound value" test so as to reasonably assure repayment. Determination of sound value considers the quality of the product or service, technical qualifications of the applicant, sales projections, and the financial status of the business concerned. However, for loans to manufacturers and distributors of solar energy systems, the financial status of the business does not have to be as sound as for other types of loans. S. Rep. No. 828, 95th Cong., 2d Sess. 9-10, reprinted in 1978 U.S. Code Cong. & Ad. News 1012, 1019. See 15 U.S.C. § 636(1)(7).

¹³²Photovoltaics, also known as solar electric, utilize the direct conversion of sunlight into electricity by means of a solid-state cell. First developed in 1954, photovoltaic cells were used solely within the space program to power satellites. Jones, Solar Electric, Assessment of Solar Technologies 27, 27 (n.d.).

¹³³P.L. 95-590, § 2, 92 Stat. 2513 (1978), 42 U.S.C. § 5581(b).

watt in 1959 to \$13 per peak watt by 1978.¹³⁴ The goal of the act was to reduce this cost to \$1 per peak watt in ten years.¹³⁵ In order to stimulate the solar photovoltaic industry, the Secretary of Energy was authorized to provide financial assistance up to 75% of the purchase price for installing photovoltaic systems at new or existing power production facilities.¹³⁶

3.4 Solar Energy Legislation During The 96th Congress

In order to facilitate the growth of solar energy applications, the 96th Congress (1979-80) enacted the Energy Security Act,¹³⁷ the Ocean Thermal Energy Conversion Research, Development, and Demonstration Act,¹³⁸ the Ocean Thermal Energy Conversion Act of 1980,¹³⁹ and the Wind Energy Systems Act of 1980.¹⁴⁰

Title II¹⁴¹ of the Energy Security Act promoted the use of biomass

¹³⁴S. Rep. No. 1262, 95th Cong., 2d Sess. 8, reprinted in 1978 U.S. Code Cong. & Ad. News 5723, 5723-24.

¹³⁵P.L. 95-590, § 2, 92 Stat. 2513 (1978), 42 U.S.C. § 5581(b)(2).

¹³⁶P.L. 95-590, § 5, 92 Stat. 2516 (1978), 42 U.S.C. § 5584.

¹³⁷P.L. 96-294, 94 Stat. 611 (1980).

¹³⁸P.L. 96-310, 94 Stat. 941 (1980).

¹³⁹P.L. 96-320, 94 Stat. 974 (1980).

¹⁴⁰P.L. 96-345, 94 Stat. 1139 (1980).

¹⁴¹P.L. 96-294, Title II, 94 Stat. 683 (1980). May be cited as the Biomass Energy and Alcohol Fuels Act of 1980.

technology¹⁴² to produce alcohol fuels.¹⁴³ Its goal was to achieve a level of alcohol fuel production equal to 10% of the gasoline consumed in the United States by 1990.¹⁴⁴ In order to focus on the production of biofuels, an Office of Alcohol Fuels was established within the Department of Energy.¹⁴⁵ Both the Secretary of Agriculture and the Secretary of Energy were authorized to issue loan guarantees,¹⁴⁶ price guarantees,¹⁴⁷ and purchase guarantees¹⁴⁸ to assure production of a sufficient quantity of alcohol fuels. In addition, the Secretary of Energy could make loans for the construction of municipal waste energy projects.¹⁴⁹

Title IV¹⁵⁰ of the Energy Security Act required the Secretary of Energy to establish programs that create incentives for use of solar energy

¹⁴²Biomass systems use almost any organic matter as a biofuel to produce energy. Organic matter includes wood from forests, agricultural and forest residues, and fast-growing herbaceous and woody energy crops grown specifically for energy production. Energy conversion is achieved by combustion (the simplest of all biomass technologies), fermentation (to produce alcohol fuels), anaerobic digestion (to produce a fuel gas) or thermochemical processes (such as gasification). Walter, Biofuels, Assessment of Solar Technologies 39, 39 (n.d.).

¹⁴³P.L. 96-294, Title II, § 202, 94 Stat. 683 (1980), 42 U.S.C. § 8801.

¹⁴⁴P.L. 96-294, Title II, § 211, 94 Stat. 686 (1980), 42 U.S.C. § 8811(b)(1).

¹⁴⁵P.L. 96-294, Title II, § 220, 94 Stat. 696 (1980), 42 U.S.C. § 8820.

¹⁴⁶P.L. 96-294, Title II, § 214, 94 Stat. 690 (1980), 42 U.S.C. § 8814.

¹⁴⁷P.L. 96-294, Title II, § 216, 94 Stat. 692 (1980), 42 U.S.C. § 8816.

¹⁴⁸P.L. 96-294, Title II, § 215, 94 Stat. 692 (1980), 42 U.S.C. § 8815.

¹⁴⁹P.L. 96-294, Title II, § 232, 94 Stat. 697 (1980), 42 U.S.C. § 8832.

¹⁵⁰P.L. 96-294, Title IV, 94 Stat. 715 (1980). May be cited as the Renewable Energy Resources Act of 1980.

resources,¹⁵¹ to disseminate information about solar energy to the public,¹⁵² and to accelerate the use of photovoltaic systems.¹⁵³

Title V¹⁵⁴ of the Energy Security Act created the Solar Energy Development Bank (Solar Bank).¹⁵⁵ The Solar Bank provides subsidies for interest rates and principal on loans for solar energy systems¹⁵⁶ and energy conservation measures.¹⁵⁷ While the Solar Bank was similar to the subsidized loan program under the National Energy Act of 1978, there were important differences. The Solar Bank provided greater incentives to the consumer by offering larger subsidies and more loans could be subsidized since the Solar Bank received greater funding.¹⁵⁸ Congress appropriated \$125 million to fund the Solar Bank for FY 1981 and FY 1982. It was scheduled to be operational by October 1, 1980.¹⁵⁹

¹⁵¹Such as programs (1) to develop combinations of renewable energy sources to replace the use of fossil fuel imports; (2) to encourage energy self-sufficiency at all levels of government; (3) to stimulate private industry participation (such as with loans and grants); and (4) to utilize abandoned industrial facilities for energy production from municipal solid waste, agricultural waste or forest products waste. P.L. 96-294, Title IV, § 406, 94 Stat. 719 (1980), 42 U.S.C. § 7374.

¹⁵²P.L. 96-294, Title IV, § 404, 94 Stat. 716 (1980), 42 U.S.C. § 7373.

¹⁵³By amendments to the Federal Photovoltaic Utilization Act, P.L. 95-619, Title V, 92 Stat. 3280 (1978).

¹⁵⁴P.L. 96-294, Title V, 94 Stat. 719 (1980). May be cited as the Solar Energy and Energy Conservation Act of 1980.

¹⁵⁵Under the control of the Department of Housing and Urban Development. P.L. 96-294, Title V, § 505, 94 Stat. 722 (1980), 12 U.S.C. § 3603.

¹⁵⁶P.L. 96-294, Title V, § 512, 94 Stat. 728 (1980), 12 U.S.C. § 3610.

¹⁵⁷P.L. 96-294, Title V, § 511, 94 Stat. 726 (1980), 12 U.S.C. § 3609.

¹⁵⁸S. Rep. No. 166, 96th Cong., 2d Sess. 41, reprinted in 1980 U.S. Code Cong. & Ad. News 1743, 1791.

¹⁵⁹President Recommends Abolishing Solar Bank, Cutting Solar Budget, 2 Solar Law Reporter 1032, 1032 (March/April 1981).

The Ocean Thermal Energy Conversion Research, Development, and Demonstration Act¹⁶⁰ required the Department of Energy to develop a comprehensive plan for conducting ocean thermal research and for its ultimate commercialization.¹⁶¹ Congress recognized that while research has demonstrated that technologies for ocean thermal energy conversions are feasible, there had been no integration between development and commercialization.¹⁶² Pursuant to the act, DOE was required to construct pilot and demonstration ocean thermal energy conversion facilities.¹⁶³ Funding for these facilities was appropriated through FY 1982.¹⁶⁴

The Ocean Thermal Energy Conversion Act of 1980 established a licensing and permitting system for ocean thermal energy conversion facilities and made these facilities eligible for federal loan guarantees.¹⁶⁵ All ocean thermal energy systems require a license to

¹⁶⁰Ocean thermal energy conversion systems utilize the temperature difference between the cold, deep seawater at depths of 2,000-3,000 feet and the surface water heated by the sun, a difference of approximately 36 degrees Fahrenheit. Trenka, Ocean Thermal Energy Conversion, Assessment of Solar Technologies 34, 34 (n.d.). In a "closed" ocean energy system, the warmer surface water is used to expand another liquid for turning a turbine attached to an electric generator. The liquid is then cooled by the deep seawater and the cycle begins anew. Id.

¹⁶¹S. Rep. No. 501, 96th Cong., 2d Sess. 4, reprinted in 1980 U.S. Code Cong. & Ad. News 2395, 2395.

¹⁶²S. Rep. No. 501, 96th Cong., 2d Sess. 5-6, reprinted in 1980 U.S. Code Cong. & Ad. News 2395, 2395-96.

¹⁶³P.L. 96-310, § 5, 94 Stat. 943 (1980), 42 U.S.C. § 9004.

¹⁶⁴P.L. 96-310, § 10, 94 Stat. 946 (1980), 42 U.S.C. § 9009.

¹⁶⁵S. Rep. No. 721, 96th Congress, 2d Sess. 1, reprinted in 1980 U.S. Code Cong. & Ad. News 2407, 2407.

operate from the National Oceanic and Atmospheric Administration.¹⁶⁶ The act amended the Merchant Marine Act, 1936¹⁶⁷ to create the Ocean Thermal Energy Conversion (OTEC) Demonstration Fund which provides loan guarantees for OTEC demonstration facilities (to include ships) by the Secretary of Commerce.¹⁶⁸ OTEC facilities and ships are eligible for loan guarantees since they are considered to be vessels operated in the foreign commerce of the United States.¹⁶⁹

The purpose of the Wind Energy Systems Act of 1980¹⁷⁰ was to establish an eight year R&D program for wind energy systems and to appropriate \$100 million for FY 1981 programs.¹⁷¹ One of the act's goals was to reduce the cost of wind energy-produced electricity to that of conventionally-produced by the end of FY 1988.¹⁷² Under the act, the

¹⁶⁶P.L. 96-320, Title I, § 101, 94 Stat. 976 (1980), 42 U.S.C. § 9111.

¹⁶⁷Chapter 858, 49 Stat. 1985 (1936) (codified in scattered sections of 46 U.S.C.).

¹⁶⁸P.L. 96-320, Title II, § 203(b), 94 Stat. 994 (1980), 46 U.S.C. § 1279c.

¹⁶⁹S. Rep. No. 501, 96th Cong., 2d Sess. 9, reprinted in 1980 U.S. Code Cong. & Ad. News 2395, 2415-16. See 46 U.S.C. § 1274.

¹⁷⁰The wind derives its energy from the sun's heating of the Earth's surface and atmosphere. FY 1981 Solar Energy Program Summary Document, supra note 20, at 19. Wind energy systems convert the kinetic energy of the wind into other forms of energy. Turbines, powered by wind-turned rotors, have been used for centuries to pump water and grind grain. Wind energy systems were popular for rural areas of the United States until the expansion of utility service in the mid-20th century. Dodge and Thresher, Wind Energy, Assessment of Solar Technologies 31, 31 (n.d.).

¹⁷¹H.R. Rep. No. 662, 96th Cong., 2d Sess. 2, reprinted in 1980 U.S. Code Cong. & Ad. News 2691, 2691.

¹⁷²P.L. 96-345, § 2, 94 Stat. 1139 (1980), 42 U.S.C. § 9201(b).

Department of Energy was authorized to use various forms of federal assistance to advance wind energy technologies such as loans, grants and direct procurement.¹⁷³

The 96th Congress also enacted Title II of the Crude Oil Windfall Profit Tax of 1980¹⁷⁴ which amended the residential energy tax credit. Under the act, the maximum tax credit for installation of renewable energy systems was increased from \$2,200 to \$4,000.¹⁷⁵ For businesses, the investment tax credit was raised from 10% to 15%, depending upon what kind of renewable energy system was installed.¹⁷⁶ In addition, the investment tax credit was extended through December 31, 1985, the same as for the residential tax credit. Moreover, the Crude Oil Windfall Profits Tax Act of 1980 established a tax credit for the production of alcohol fuels.¹⁷⁷

3.5 Solar Energy R&D - No More "Bare Bones" Budgets

For FY 1979, the federal solar R&D budget increased from \$444 million to \$554 million¹⁷⁸ and the potential for solar energy becoming a viable

¹⁷³P.L. 96-345, § 6, 94 Stat. 1142 (1980), 42 U.S.C. § 9205.

¹⁷⁴P.L. 96-223, 94 Stat. 229 (1980).

¹⁷⁵P.L. 96-223, Title II, § 202(a), 94 Stat. 258 (1980), amending Internal Revenue Code § 44C(b), 26 U.S.C. § 44C(b)(2).

¹⁷⁶P.L. 96-223, Title II, § 221(a), 94 Stat. 260 (1980), amending Internal Revenue Code § 46(a), 26 U.S.C. § 46(a)(2)(C).

¹⁷⁷P.L. 96-223, Title II, § 231(a), 94 Stat. 268 (1980), codified in Internal Revenue Code § 44D, 26 U.S.C. § 44D.

¹⁷⁸Domestic Policy Review, supra note 1, at 7-8.

alternative to fossil fuel never looked more promising. Finally, the solar energy budgets mirrored a serious commitment by the federal government. From a FY 1974 budget of \$15 million, federal solar energy R&D funding had increased by 3,600%.

In his National Solar Message of June 20, 1979, President Carter stated:¹⁷⁹

We have a great potential and a great opportunity to expand dramatically the contribution of solar energy between now and the end of the century. I am today establishing for our country an ambitious and very important goal for solar and renewable sources of energy. It is a challenge to our country and to our ingenuity. We should commit ourselves to a national goal of meeting one-fifth of our energy needs with solar and renewable resources by the end of the century. This goal sets a high standard against which we can collectively measure our progress in reducing our dependence on oil imports and securing our country's energy future. It will require that all of us examine carefully the potential solar and renewable technologies hold for our country and invest in these systems wherever we can.

At this time, President Carter also announced the formation of a standing Subcommittee on Solar Energy under the cabinet level Energy Coordination Council. This subcommittee was responsible for ensuring the entire federal government was working to accelerate development of solar energy technologies.¹⁸⁰

¹⁷⁹FY 1981 Solar Energy Program Summary Document, supra note 20, at 7-8.

¹⁸⁰Id. at 14.

The renewed commitment to solar energy spawned by Sun Day continued to be reflected in the federal solar energy R&D budgets. For FY 1980, the Department of Energy's solar energy R&D budget totalled \$549 million, a minor reduction from FY 1979.¹⁸¹ In FY 1981, it rose to \$579 million.¹⁸²

FEDERAL SOLAR ENERGY BUDGET
(\$ Million)

<u>Fiscal Year</u>	<u>Solar R&D</u>
1974	15
1975	54
1976	152
1977	313
1978	444
1979	554
1980	549
1981	579

It is amazing to note that from FY 1974 to FY 1981, federal solar energy R&D funding increased over 3,750%!

3.6 The End Of The Carter Administration

At the end of the Carter Administration, it appeared as if the solar

¹⁸¹FY 1982 Congressional Budget Request - Solar Energy, U.S. Department of Energy 15, 28 (n.d.).

¹⁸²Id.

energy advocates had gained political acceptance. Solar energy was now part of the Congressional and Presidential mindset. The solar energy industry, which was in its infancy at the time of the first solar legislation by the 93rd Congress, had grown tremendously. By 1980, there were 133 firms engaged in the manufacture of solar energy collectors, 161 involved in installation of solar energy systems, 195 in systems design and consulting, 239 in wholesale and 182 in retail sales.¹⁸³

Certainly, there were failures under the Carter Administration's implementation of solar energy policy. Though its goal was for solar energy and other renewables to provide 20% of the nation's energy needs by 2000, the proposed solar initiatives were inadequate to meet this goal.¹⁸⁴ However, initiatives could always be modified. The more important issue was that solar energy had finally found federal acceptance.

Based upon the status of the solar energy movement at the end of President Carter's first term, it appeared only a catastrophe could stand in the way of the continued development of solar energy technologies. Catastrophe of a political nature, however, was right around the corner for President Carter and solar energy in the guise of a former Governor of California. And if Sun Day was indeed the dawn of the solar age, the election of Ronald Reagan can be viewed as its eclipse.

The renewed commitment by the federal government to the advancement of

¹⁸³Frankel, supra note 75, at 13.

¹⁸⁴It was estimated that these solar programs, plus hydropower, would actually result in a 15% energy contribution. Domestic Policy Review, supra note 1, at 39.

solar energy technologies as a viable energy alternative would soon fade. Solar energy was destined, once again, to become the "poor stepchild" of fossil fuel. And all too soon, the clamor of support typified by Sun Day would become a deafening silence.

Chapter 4

THE REAGAN LANDSLIDE THAT ALMOST BURIED THE FEDERAL SOLAR ENERGY PROGRAM

President Reagan's election in November 1980 saw a major swing in the United States from an era of political, economic and social liberalism to one of a conservative "less federal government interference" philosophy. This philosophy had a significant adverse impact on the federal government's support of solar energy R&D. In addition, President Reagan's personal feelings toward solar energy¹⁸⁵ may have placed an additional burden on the development of solar energy technologies.

4.1 A New President, A New Attitude About Solar Energy

In his budget report to Congress, President Reagan proposed the Solar Bank be abolished since other federal programs, in his opinion, duplicated the Solar Bank's objectives.¹⁸⁶ Further, he recommended the R&D budget for the Department of Energy's solar energy programs be reduced approximately 50% by FY 1982.¹⁸⁷ President Reagan reasoned that solar tax credits and the increase in fossil fuel prices brought about by the federal decontrol of oil and natural gas would provide the needed

¹⁸⁵Interview with Sklar, supra note 74.

¹⁸⁶Rescission Proposal No. R-82-22 H. Doc. 97-140 (February 18, 1981).

¹⁸⁷President Recommends Abolishing Solar Bank, Cutting Solar Budget,
supra note 161, at 1032.

incentives to develop solar energy technologies by the private sector.¹⁸⁸
In addition, President Reagan proposed even more solar energy budget cuts through FY 1986.¹⁸⁹

<u>FISCAL YEAR</u>	<u>PROJECTED BUDGET</u>	<u>REAGAN PROPOSAL</u>
1982	\$583 million	\$220 million
1983	\$664 million	\$236 million
1984	\$623 million	\$251 million
1985	\$595 million	\$265 million
1986	\$553 million	\$278 million

As can be seen, these budgets represented a drastic departure from the solar energy R&D budgeting trend of the Carter Administration. And though Congress did not agree with President Reagan in abolishing the Solar Bank,¹⁹⁰ he would get his way with the DOE solar energy R&D budget reductions.

4.2 Reaganomics And Solar Energy Policy

Perhaps the most significant influence the Reagan Administration had on the federal government's support of solar energy was the concept of using a cost-benefit analysis in determining the federal budget. It mirrored President Reagan's fundamental premise of economics - "let the

¹⁸⁸Id.

¹⁸⁹Id.

¹⁹⁰The Solar Bank is still operational and uses funding from a pool of money unspent from earlier appropriations. Sklar, supra note 10, at 130.

private sector do it."

It was Reagan Administration policy that "the federal government should not sponsor research and development that industry would be expected to undertake on its own."¹⁹¹ Instead, the federal role shifted the focus of DOE's solar activities from costly, near-term development, demonstration and commercialization efforts, and into longer-range research R&D. The free enterprise marketplace and not the government would be expected to support the commercial introduction of new and alternative technologies into the marketplace."¹⁹²

Reliance on private sector development was influenced by the Director of the Office of Management and Budget, David Stockman. Stockman believed energy should be treated as any other commodity and the Carter policy of federal regulation of energy was an interference in the workings of the free marketplace.¹⁹³ Moreover, the new Secretary of Energy, James Edwards, was an advocate of nuclear power. Stockman and Edwards formulated an energy policy which prescribed a free market for all types of energy, except nuclear which would receive extensive federal support.¹⁹⁴

4.3 Solar Energy Fails To Meet Expectations

A factor that probably influenced Congress to support President

¹⁹¹FY 1982 Congressional Budget Request - Solar Energy, supra note 183, at 25.

¹⁹²Frankel, supra note 75, at 7.

¹⁹³Stockman, The Wrong War? The Case Against a National Energy Policy, The Public Interest 1, 1-44 (May 1978).

¹⁹⁴Frankel, supra note 75, at 33.

Reagan's decision to minimize the extent of future federal support for solar energy R&D was the poor track record of solar energy technologies. By 1981, almost seven years after enacting the Solar Heating and Cooling Demonstration Act of 1974, only 136 of the 287 DOE commercial demonstration projects were operational.¹⁹⁵ Moreover, the cost of the federal solar technology demonstration program was much greater than anticipated. In 1973, it was estimated that it would cost between \$4 and \$8 per foot to construct a solar heating and cooling system.¹⁹⁶ By 1981, the actual cost was determined to be as high as \$77 per foot in commercial demonstrations and \$40 per foot in residential demonstrations.¹⁹⁷

In addition to being extremely expensive, the solar heating and cooling systems were not dependable. In the HUD program where solar equipment could be purchased from any manufacturer, it was reported "an inordinately high percentage of the total number of solar systems in the demonstration project required significant repair and that these systems depict a horrendous consumer problem."¹⁹⁸ Thus, the Solar Heating and Cooling Demonstration Act of 1974, which was intended to show the practical use of solar technology, instead indicated the opposite. An internal

¹⁹⁵Solar Heating and Cooling Demonstration Program Assessment, Vol. 1, U.S. Department of Energy (June 1981).

¹⁹⁶Frankel, supra note 75, at 10.

¹⁹⁷Solar Heating and Cooling Demonstration Program Assessment, Vol. 1, supra note 197.

¹⁹⁸BE&C Engineers, Inc., Final Report of the Management Support Contractor on the Residential Solar Heating Demonstration: A Report to the U.S. Department of Housing and Urban Development (1983).

Department of Energy memorandum in 1980 described the failure of this ambitious solar energy program as follows:¹⁹⁹

The Solar Heating and Cooling Demonstration Act was passed by Congress in 1974 when the solar industry was virtually nonexistent. The components available for testing were experimental and mostly unproven; the large scale systems assembled with these components were prototypes. . . Given the state of the art in 1974 and the state of the marketplace. . . the goals of the Act were premature and unrealistic. . . Most of the early solar demonstration projects were designed by architects and engineers with little, if any, solar experience. The solar equipment was the first of its kind and the manufacturers had no track record of reliability or durability. Production facilities were very limited.

4.4 The Federal Solar Energy Budget Begins To Deteriorate

The FY 1982 federal solar energy R&D budget reflected the Reagan Administration's opposition to federal involvement in solar energy technology development. For FY 1982, the Department of Energy's solar energy budget request was a paltry \$193 million;²⁰⁰ the actual appropriation was \$227 million.²⁰¹ The FY 1982 solar budget represented a 60% decrease from FY 1981 [which mirrored the drastic budget reductions proposed by President Reagan]. Federal support for solar energy was premised on the deregulation of oil and natural gas, residential and

¹⁹⁹SA Response to GAO Report on Commercial Solar Demonstration Program, Department of Energy, Office of Solar Applications for Buildings to Donald Gestler, Office of the Controller (March 18, 1980).

²⁰⁰FY 1982 Congressional Budget Request - Solar Energy, supra note 183, at 28.

²⁰¹FY 1983 Congressional Budget Request - Solar Energy, U.S. Department of Energy 13, 18 (n.d.).

business tax credits, and research and development of promising solar energy technologies. Near-term technology development, however, would be the domain of the private sector.²⁰²

Congress cooperated in the deemphasis of federal involvement in solar energy R&D based upon the Reagan Administration's assertion that the private sector was best able to develop and commercialize solar energy technologies. The Reagan Administration believed the higher oil prices resulting from federal deregulation and the expanded business opportunities from the revived economy would act as a catalyst for solar technology development and more than make up for the decrease in the federal solar energy R&D budget.

Lack of any substantive opposition in Congress prompted the Reagan Administration to propose deeper solar budget cuts for FY 1983. Even the solar business investment tax credit, a mainstay in enabling the renewable energy industry to stay afloat, was proposed for rescission²⁰³.

Though the Reagan Administration had projected the recovery of the economy, instead the nation became mired in a recession. In addition, oil prices decreased and the relative cost of solar energy became even more prohibitive. Therefore, the private sector had neither the resources or financial incentives to develop solar energy technologies.²⁰⁴

Since the marketplace was not able to fill the void left by the federal government solar energy R&D budget cuts, Congress began to question

²⁰²FY 1982 Congressional Budget Request - Solar Energy, supra note 183, at 16.

²⁰³Frankel, supra note 75, at 34.

²⁰⁴Id.

the Reagan Administration's basic premise that the private sector was best suited to ensure a viable national solar energy program. As a result, when the Department of Energy requested a solar energy budget of \$72 million for FY 1983,²⁰⁵ Congress refused to gut it so severely and appropriated \$202 million.²⁰⁶ Though the DOE solar budget was still less than that for FY 1982, it was the first setback for the Reagan Administration's heretofore unobstructed dismantling of federal policy in support solar energy development.

Unfortunately, the impact of the Reagan Administration was already quite severe. Solar energy research programs which had been progressing toward well-defined goals were either disbanded, redirected or reduced in scope. Further, experienced program managers at DOE were replaced by personnel with less experience in the solar energy field.²⁰⁷ The end result was that without federal involvement in demonstrating solar energy applications, transfer of this technology to the private sector could not take place and few businessmen were willing to take the risk of "ground floor" development of unproven solar technologies. Therefore, solar energy R&D in the private sector eventually became stagnant.²⁰⁸

The Reagan Administration attitude toward who was

²⁰⁵FY 1983 Congressional Budget Request - Solar Energy, supra note 203, at 18.

²⁰⁶FY 1984 Congressional Budget Request - Solar Energy, U.S. Department of Energy 13, 21 (n.d.).

²⁰⁷Frankel, supra note 75, at 35.

²⁰⁸Id. at 36.

responsible for solar energy R&D did not change for FY 1984, as the Department of Energy requested a solar energy budget of \$87 million.²⁰⁹ Though Congress actually appropriated \$182 million,²¹⁰ the trend of ever-decreasing federal solar energy budgets continued.

For FY 1985, the Department of Energy requested a solar budget of \$164 million;²¹¹ Congress appropriated \$178 million,²¹² an increase of \$14 over FY 1984. The DOE budget request was significant in that it was an 88% increase over DOE's solar budget request from the previous year. This was a marked departure from DOE's usual policy of attempting to reduce its solar R&D budget each succeeding year.

This aberration appeared to reflect a concept identified in a 1985 Department of Energy report. Here, DOE recognized that federal investment in R&D added stability to an immature solar energy industry.²¹³ In addition, DOE stated the private sector may be unwilling to invest in a particular solar application area which holds great promise, but still requires a substantial amount of technical progress. Therefore, federal

²⁰⁹FY 1984 Congressional Budget Request - Solar Energy, supra note 208, at 19.

²¹⁰FY 1985 Congressional Budget Request - Solar Energy, U.S. Department of Energy 21, 26 (n.d.).

²¹¹Id.

²¹²FY 1986 Congressional Budget Request - Solar and Other Renewables, U.S. Department of Energy 21, 31 (n.d.).

²¹³Renewable Energy Research and Development Outlook, Vol. 1, U.S. Department of Energy, Office of Conservation and Renewable Energy 1, 6 (February 1985).

R&D can provide the progress necessary to entice the private sector to invest in further development.²¹⁴

4.5 Solar Energy Legislation During The 97th Congress

Compared with the legislation enacted during the Ford and Carter Administrations, the 97th Congress (1981-82) did little to advance the development of solar energy. In fact, the 97th Congress wasted little time in passing legislation detrimental to the solar energy movement. The Omnibus Budget Reconciliation Act of 1981²¹⁵ amended the Solar Energy and Energy Conservation Act of 1980.²¹⁶ This limited appropriations for FY 1982, FY 1983 and FY 1984 which were to be used by the Solar Bank for financing the purchase and installation of residential and commercial solar energy applications. Appropriations for each fiscal year could not exceed \$50 million.²¹⁷ In addition, the act amended the Biomass Energy and Alcohol Fuels Act of 1980,²¹⁸ which reduced the appropriations for implementing the alcohol fuels programs by \$280 million.²¹⁹

On a positive solar note, the 97th Congress did enact the Military

²¹⁴Id. at 5.

²¹⁵P.L. 97-35, 95 Stat. 357 (1981).

²¹⁶P.L. 96-294, Title V, 94 Stat. 719 (1980).

²¹⁷P.L. 97-35, Title X, § 1071, 95 Stat. 622 (1981), 12 U.S.C. § 3620.

²¹⁸P.L. 96-294, Title II, 94 Stat. 683 (1980).

²¹⁹P.L. 97-35, Title X, § 1063, 95 Stat. 622 (1981), 42 U.S.C. § 8803(a).

Construction Codification Act.²²⁰ This act required the Secretary of Defense to encourage the use of solar energy and other renewables in military construction projects (including family housing) where such use would be practical and economically feasible.²²¹ Solar energy systems would be considered in the design of all new facilities. If solar energy systems would be cost effective and have the potential of significant savings of fossil fuel-derived energy, installation was required.²²² Further, increases in cost or floor area authorizations were permitted if needed to install solar energy systems.²²³

4.6 Solar Energy Legislation During The 98th Congress

The 98th Congress (1983-84) delivered another blow to the Solar Bank when it amended the Omnibus Budget Reconciliation Act 1981. This amendment further reduced the FY 1984 appropriation for the Solar Bank from \$50 million to \$35 million.²²⁴

By enacting the Renewable Energy Industry Development Act of 1983,²²⁵ an amendment to the Energy Policy and Conservation Act,²²⁶ the

²²⁰P.L. 97-214, 96 Stat. 154 (1982).

²²¹P.L. 97-214, § 2(a), 96 Stat. 166 (1982), 10 U.S.C. § 2857.

²²²H.R. Rep. No. 612, 97th Cong., 2d Sess. 27-28, reprinted in 1982 U.S. Code Cong. & Ad. News 441, 466-67.

²²³Id. at 27.

²²⁴P.L. 98-181, Title IV, § 463(f)(1), 97 Stat. 1235 (1983), 12 U.S.C. § 3620.

²²⁵P.L. 98-370, 98 Stat. 1211 (1984).

²²⁶P.L. 94-163, 89 Stat. 871 (1975).

98th Congress attempted to enhance the export potential of the domestic solar (and other renewables) energy industry.²²⁷ Pursuant to this act, the Secretary of Commerce had to assess the competitiveness of the industry and implement a program to coordinate and strengthen federal support.²²⁸ The need for this legislation was prompted by the steady decline of the nation's solar and renewable energy exports.²²⁹ As will be seen later, the intent of this act was never fulfilled - the United States was destined never to assume world leadership in the export of solar and other renewable energy technologies.

4.7 The Impact Of President Reagan's First Four Years

The FY 1984 DOE budget signaled the end of the first four years of the Reagan Administration. It is not an exaggeration to state the solar energy industry, which had shown so much potential by the end of the Carter Administration, was now reeling. Compared to FY 1981, the reductions in federal R&D reduced the DOE solar budget by over 69%.

President Reagan's 1981 proposal to shift the focus of Department of Energy solar energy programs from near-term R&D to longer-range R&D had disastrous consequences to the commercialization of solar energy technologies. The private sector was incapable of filling the void left by the departure of Federal support. And it would only become worse!

²²⁷S. Rep. No. 508, 98th Cong., 2d Sess. 1, reprinted in 1984 U.S. Code Cong. & Ad. News 2222, 2222.

²²⁸P.L. 98-370, § 2, 98 Stat. 1211 (1984), 42 U.S.C. § 6276.

²²⁹Since 1980, the United States' market share of world photovoltaic sales declined by 20%. S. Rep. No. 508, 98th Cong., 2d Sess. 2, reprinted in 1984 U.S. Code Cong. & Ad. News 2222, 2223.

Chapter 5

FOUR MORE YEARS - REAGAN JUST SAYS "NO" TO SOLAR ENERGY

President Reagan's reelection in November 1984 signaled four more years of federal indifference toward solar energy. DOE reasserted the federal role in the development of solar energy technologies as being premised on minimizing federal control and involvement in energy markets, thereby creating a marketplace where all energy technologies would (or should) compete on an equal basis. All direct federal funding would be reserved for research areas in which private sector investment was nonexistent or extremely limited.²³⁰

5.1 Solar Energy Hopes Are Dashed

For FY 1985, the Department of Energy had reversed its long-standing trend of "bare bones" budget requests. Solar advocates may have hoped that DOE was indicating a renewed interest in solar energy. However, for FY 1986, the Department of Energy requested a solar energy budget of \$148 million,²³¹ \$16 million less than its FY 1985 budget request. Congress appropriated \$145 million.²³²

²³⁰Renewable Energy Research and Development Outlook, Vol. 1, supra note 215, at 4.

²³¹Id.

²³²FY 1987 Congressional Budget Request - Solar and Other Renewables, U.S. Department of Energy 9, 24 (n.d.).

If there still was doubt regarding DOE's stance on federal involvement in solar energy R&D, it was resolved by the FY 1987 solar budget. DOE's \$72 million solar budget request for FY 1987 was its lowest ever. The Department of Energy based its reduced request on budgetary restraints,²³³ but considered it adequate due to "the appropriate federal role [in R&D] and the need to progressively reduce federal budget deficits."²³⁴ The final appropriation for FY 1987 was \$124 million.²³⁵ Further, DOE reiterated its support of energy market deregulation to encourage a free, competitive market in which renewable and conventional energy can be developed and used efficiently and cost effectively.²³⁶

It was clear that Reagan Administration budget cuts were having an adverse impact on the solar energy industry. Though Congress had enacted legislation four years earlier²³⁷ to stimulate the export of American solar energy technologies, this goal never materialized. By 1987, the United States was only the #3 exporter of solar and other renewable energy equipment and had a trade deficit in this area of \$53.1 million.²³⁸

²³³Id. at 17.

²³⁴Id. at 16.

²³⁵FY 1988 Congressional Budget Request - Solar and Other Renewables, U.S. Department of Energy 11, 18 (n.d.).

²³⁶Energy Security, supra note 9, at 209.

²³⁷The Renewable Energy Industry Development Act of 1983, P.L. 98-370, 98 Stat. 1211 (1984).

²³⁸Renewable Energy for the World, U.S. Export Counsel for Renewable Energy 1, 6 (1990).

Moreover, 1987 exports had decreased by \$28.6 million from the previous year.²³⁹

RENEWABLE ENERGY EQUIPMENT IMPORT/EXPORT LEADERS²⁴⁰
(\$ Million)

<u>Country</u>	<u>86 Imports</u>	<u>87 Imports</u>	<u>86 Exports</u>	<u>87 Exports</u>
U.S.	137.7	160.4	135.9	107.3
W. Germany	87.3	112.0	280.7	354.8
France	60.4	66.6	68.9	127.5
S. Korea	88.4	151.4	40.4	87.1
Japan	n/a	n/a	98.5	87.1

The increasing trade imbalance in renewable energy equipment sales should have served as a "wake-up call" to the federal government, but no change in solar energy policy resulted. For FY 1988, DOE requested a solar budget of \$71 million;²⁴¹ Congress appropriated \$97 million.²⁴² More cuts continued in FY 1989 as DOE requested a solar energy budget of \$80 million.²⁴³ The final appropriation for FY 1989 totalled \$92 million.²⁴⁴

²³⁹Id.

²⁴⁰Id.

²⁴¹FY 1988 Congressional Budget Request - Solar and Other Renewables, *supra* note 237, at 18.

²⁴²FY 1989 Congressional Budget Request - Solar and Renewable Energy, U.S. Department of Energy 17, 26 (n.d.).

²⁴³Id. at 24.

²⁴⁴FY 1990 Congressional Budget Request - Solar Energy, U.S. Department of Energy 19, 24 (n.d.).

In spite of the solar energy budget cuts, however, solar energy continued to make progress as an important energy alternative. In 1988, solar energy contributed approximately 4% of the nation's energy needs.²⁴⁵ This was a 100% increase from 1981.²⁴⁶ It is a matter of conjecture on the impact Reagan Administration policy actually had on solar energy technology development. But, it seems clear to solar advocates that, if not for the sudden departure from Carter Administration policy,²⁴⁷ solar energy would have made even more advances.²⁴⁸

5.2 Solar Energy Legislation During The 99th Congress

The only legislation enacted by the 99th Congress (1985-86) of any significance to the solar energy movement was the Tax Reform Act of 1986.²⁴⁹ This retroactively extended the solar business investment tax credit, which had already expired, from January 1, 1986 through December 31, 1988 at a 10% tax rate.²⁵⁰

²⁴⁵Out of 82 quads consumed, solar energy provided 3.34 quads. Non-solar renewable technologies, such as hydropower (3.14 quads) and geothermal (.23 quads), supplied the rest. Renewable Energy for the World, supra note 240, at 5.

²⁴⁶FY 1982 Congressional Budget Request - Solar Energy, supra note 183, at 17.

²⁴⁷Which emphasized federally-sponsored solar energy R&D.

²⁴⁸Interview with Sklar, supra note 74.

²⁴⁹P.L. 99-514, 100 Stat. 2085 (1986).

²⁵⁰P.L. 99-514, Title IV, § 421(a), 100 Stat. 2229 (1986), amending Internal Revenue Code § 46(b), 26 U.S.C. § 46(b)(2)(A).

5.3 Solar Energy Legislation During The 100th Congress

The 100th Congress (1987-88) amended the Powerplant and Industrial Fuel Use Act of 1978.²⁵¹ It also enacted the Alternative Motor Fuels Act of 1988²⁵² and the Technical and Miscellaneous Revenue Act of 1988.²⁵³

The amendments to the Powerplant and Industrial Fuel Use Act of 1978 repealed the prohibition on the use of natural gas and oil as primary fuels for new electric powerplants²⁵⁴ and new major fuel-burning installations.²⁵⁵ Originally, the prohibition was based on short supplies and escalating prices of natural gas and oil spawned by the 1973 OPEC oil embargo, which were expected to continue for the foreseeable future.²⁵⁶ However, since 1978, prices had fallen due to a persistent glut in oil and natural gas supplies. As a result, these fossil fuels were no longer viewed as unreliable.²⁵⁷ This legislation, which allowed consumers to make their own fuel choices in an increasingly deregulated marketplace, was a classic example of Reaganomics.²⁵⁸

²⁵¹P.L. 100-42, 101 Stat. 310 (1987).

²⁵²P.L. 100-494, 102 Stat. 2441 (1988).

²⁵³P.L. 100-647, 102 Stat. 3342 (1988).

²⁵⁴P.L. 100-42, § 1(c)(4)(A), 101 Stat. 311 (1987), 42 U.S.C. § 8311.

²⁵⁵P.L. 100-42, § 1(a)(1), 101 Stat. 310 (1987), 42 U.S.C. § 8312.

²⁵⁶Id.

²⁵⁷Id. at 274.

²⁵⁸H.R. Rep. No. 78, 100th Cong., 1st Sess. 2, reprinted in 1987 U.S. Code Cong. & Ad. News 270, 271.

The purpose of the Alternative Motor Fuels Act of 1988 is to increase the availability of alternative fuel²⁵⁹ motor vehicles by providing automobile manufacturers with incentives to develop them.²⁶⁰ Incentives are in the form of increases in the corporate average fuel economy (CAFE) ratings for automobiles manufactured after model year 1993.²⁶¹ An automobile which can operate on alternative fuels receives a higher CAFE rating than one capable of being operated only on gasoline or diesel fuel.²⁶² The Alternative Motor Fuels Act of 1988 also mandated alternative fuel use by light duty federal vehicles beginning in FY 1991. Under this program, the Department of Energy ensures that federal agencies purchase the maximum practicable number²⁶³ of alternative fuel vehicles and study the performance of the vehicles in comparison to conventionally-powered vehicles.²⁶⁴

The Technical and Miscellaneous Revenue Act of 1988 was another chapter in the "life and death" struggle of the solar business investment

²⁵⁹Such as methanol, ethanol and natural gas.

²⁶⁰S. Rep. No. 271, 100th Cong., 2d Sess. 1, reprinted in 1988 U.S. Code Cong. & Ad. News 3016, 3016.

²⁶¹P.L. 100-494, § 6(a), 102 Stat. 2448 (1988).

²⁶²S. Rep. No. 271, 100th Cong., 2d Sess. 2, reprinted in 1988 U.S. Code Cong. & Ad. News 3016, 3017.

²⁶³Cost of the alternative fuel vehicle would not be a factor unless its initial cost exceeds the cost of a gasoline or diesel powered vehicle by 5%. 42 U.S.C. § 6374(a)(2).

²⁶⁴P.L. 100-494, § 4(a), 102 Stat. 2442 (1988).

tax credit. It was extended through December 31, 1989.²⁶⁵

5.4 President Reagan And Solar Energy - Aloofness Or Disdain?

FY 1989 was significant in that it represented the end of the Reagan Administration and its indifference to solar energy. Looking back, it is abundantly clear that federal funding in support of solar energy, which reached its zenith in FY 1981, had plummeted to its lowest depths since FY 1975. Based upon this emasculation of the federal solar energy budget, one must wonder if the Reagan Administration ever had any real interest in solar energy becoming a viable alternative to fossil fuels.

In fact, President Reagan may have been far more than merely indifferent to solar energy. Solar energy is viewed by many as a concept championed by liberals,²⁶⁶ especially "Earth Shoe-wearing" Democrats. At the time of Reagan's election as President, the two most well-known proponents of solar energy were Governor Jerry Brown of California and Carter.²⁶⁷ President Carter had solar energy panels installed on the White House.

It has been suggested that because people he politically-disliked supported development of solar energy technologies, President Reagan chose

²⁶⁵P.L. 100-647, Title I, § 4006, 102 Stat. 3652 (1988), amending Internal Revenue Code § 46(b), 26 U.S.C. § 46(b)(2)(A).

²⁶⁶Interview with Sklar, supra note 74.

²⁶⁷Id.

to dismantle the solar energy industry in favor of more traditional fossil fuels.²⁶⁸

While this argument is speculative, it may have merit. President Reagan's apparent disdain for solar energy technology did not take long to be demonstrated. Within six months of his inauguration, he ordered the solar panels removed!²⁶⁹

5.5 Reaganomic's Legacy To Solar Energy

The "bottom line" is that no matter what President Reagan's motives were, federal policy toward solar energy was now decidedly different than under the Carter Administration. Instead of the federal government taking the lead in solar R&D, this burden was placed on the private sector. And by its attempt "to eliminate all technology development and demonstration activities, the Reagan Administration rendered ineffective the very vehicle by which technology transfer to private industry could have taken place."²⁷⁰ Without this technology transfer, corporate leaders were reluctant to invest funds in ventures that had a high probability of failure or took too long to realize a payback.²⁷¹ As a consequence, the domestic solar energy industry was becoming less competitive in the world

²⁶⁸Id.

²⁶⁹Lepkowski, Energy Policy, Chemical & Engineering News 20, 23 (June 17, 1991).

²⁷⁰Frankel, supra note 75, at 36.

²⁷¹Id. at 36.

renewable energy market. In addition, it appeared as if the federal solar energy R&D budget was on "life support."

By the end of the Reagan Administration, the promise of Sun Day was a distant memory. Though solar energy technologies had demonstrated an increased importance in the nation's energy supply, there was no way that solar energy could live up to its potential on the current R&D budget. From a FY 1981 high of \$579 million, the FY 1989 solar budget had decreased by over 84%. The only hope for solar energy advocates was founded in the upcoming Presidential election and the knowledge that the Constitution prohibited a third term.

Chapter 6

SOLAR ENERGY RECOVERY DURING THE BUSH PRESIDENCY

During the 1988 campaign, President Bush promised to carry on the policies of the Reagan Administration. Whether this promise would also apply to federal solar energy policy remained to be seen. Unfortunately, the initial answer was that federal support for solar energy R&D would not be altered.

For FY 1990, the Department of Energy's solar energy R&D budget request was \$71 million,²⁷² even less than the previous year's request. Congress appropriated \$90 million,²⁷³ a \$2 million reduction from the FY 1989 solar energy budget. Based upon FY 1990, there was no indication the Bush Administration would soon begin an about-face in its solar energy policy, but that is what happened.

6.1 The Stirring Of New Solar Energy Hope

The Department of Energy's solar energy budget request for FY 1991 was \$116 million,²⁷⁴ a 64% increase over its FY 1990 budget request. The final

²⁷²FY 1990 Congressional Budget Request - Solar Energy, supra note 246, at 24.

²⁷³FY 1991 Congressional Budget Request - Solar and Renewable Energy, U.S. Department of Energy 13, 22 (n.d.).

²⁷⁴Id. at 22.

FY 1991 appropriation was \$129 million.²⁷⁵ This increase in the federal solar energy budget was hailed by the Solar Energy Industries Association as "a bold attempt by the [Bush] Administration to reinvigorate the federal solar energy research program and demonstrate to our international competitors that the United States hasn't given up on solar energy development."²⁷⁶

Certainly, there was reason for optimism. Compared to the FY 1990 solar energy R&D budget, appropriations had increased by 44%. Funding for photovoltaics R&D increased by over \$11 million; for solar thermal by \$4.5 million.²⁷⁷

Fortunately for solar advocates, the FY 1991 solar energy budget was not an aberration. The trend continued in FY 1992, as the Department of Energy requested a solar budget of \$143 million.²⁷⁸ The final appropriation totalled \$176 million.²⁷⁹

The fact that the Department of Energy requested a solar energy budget which was greater than the FY 1991 Congressional appropriation did not go unnoticed by the pro-solar movement. This was truly a significant event. During the Reagan Administration, the DOE had never requested a solar

²⁷⁵FY 1992 Congressional Budget Request - Solar Energy, U.S. Department of Energy 15, 28 (n.d.).

²⁷⁶Sklar, supra note 10, at 125.

²⁷⁷Id.

²⁷⁸FY 1992 Congressional Budget Request - Solar Energy, supra note 277, at 26.

²⁷⁹Conferees Vote More Money for DOE Solar Programs in FY 93, The Solar Letter 195, 195 (September 18, 1992).

energy budget greater than the previous year's appropriation.

The current solar energy budget is equally encouraging. It appears to reflect the increased emphasis on solar energy and other renewables as outlined in President Bush's National Energy Strategy. For FY 1993, the Department of Energy requested a solar energy budget of \$176 million.²⁸⁰ Congress appropriated \$187 million, an \$11 million increase over FY 1992. This budget is considered to be very beneficial for solar energy systems powered by biofuels, wind and photovoltaics.²⁸¹

FY 1993 SOLAR ENERGY BUDGET
(\$ Million)

	<u>DOE Request</u>	<u>Final</u>
Solar Buildings	2.0	3.0 ²⁸²
Photovoltaics	63.5	65.5
Solar Thermal	27.0	27.0
International	2.0	2.0
Technology Transfer	2.0	2.0
National Renewable Research Laboratory ²⁸³	6.555	6.555
Biofuels	48.35	48.35

²⁸⁰Id.

²⁸¹Id.

²⁸²An additional \$3.3 million for solar building technology was provided through Department of Interior appropriations. A portion of this increased funding is directed toward cooling technologies to help meet the 1995 phaseout of chlorofluorocarbons. Solar Energy Industries Association.

²⁸³Formerly known as the Solar Energy Research Institute, President Bush elevated its status to a National Laboratory in September 1991.

Ocean Energy	0	1.0
Wind	22.0	24.0
Solar Program Support	.948	.948
Resource Assessment	1.2	1.2
Program Direction	5.872	5.872

6.2 The National Energy Strategy

President Bush released his National Energy Strategy on February 20, 1991. At its introduction, President Bush stated:²⁸⁴

Instead of finding only gasoline at the corner station, we want Americans to be able to choose from a range of environmentally sound and cleaner fuels: ethanol, methanol, electricity, propane, natural gas, and cleaner gasoline. Where America's towns and cities were once able to buy electricity from only one utility company, we want to help spur competition in the electric power business and we plan for electricity produced from renewable resources to rise by 16%. We want to build an energy future that's based on a range of diversified sources so that never again will this nation's well-being be swayed by events in a single foreign country.

The objectives of the National Energy Strategy are (1) to achieve a balance among the nation's increasing need for reasonably-priced energy; (2) the commitment to a safer, healthier environment; (3) the determination to maintain an economy second to none; and (4) to reduce dependence by the United States and its allies on potentially unreliable

²⁸⁴Lepkowski, supra note 271, at 23.

energy suppliers.²⁸⁵ In developing a National Energy Strategy, public comment was sought. The result was almost unanimous support for the development and use of solar and other renewable energy sources because of their environmental and energy security advantages.²⁸⁶

National Energy Strategy is based on the premise that investment in R&D to increase technology performance and reduce costs is a more appropriate role for the federal government than is using taxes or regulations to subsidize or mandate the use of particular technologies.²⁸⁷ Specific solar and renewable energy measures under the National Energy Strategy are to (1) encourage environmentally-acceptable hydroelectric power; (2) reduce the cost of, and increase industry confidence level in, selecting solar, wind, biomass and geothermal technologies to generate electricity; (3) support the conversion of municipal solid waste to electricity; (4) develop economical liquid fuels from biomass as alternatives to petroleum-based fuels; (5) use renewable energy for direct heating, cooling, and lighting in buildings; and (6) extend the solar business investment tax credit.²⁸⁸ It is predicted that implementing these measures will increase the output of solar and renewable energy systems an additional 14% by 2000.²⁸⁹

Some people decried the National Energy Strategy as an "embarrassment"

²⁸⁵National Energy Strategy, U.S. Department of Energy 1, 2 (February 1991).

²⁸⁶Id. at 14.

²⁸⁷Id.

²⁸⁸Id. at 14-15.

²⁸⁹Id. at 15.

with too much emphasis on placating the oil, nuclear and automobile lobbies and too little for the advancement of renewable energy sources.²⁹⁰ Others, however, expect the National Energy Strategy "to be more pro-solar than anything else [the solar energy industry has seen] in the last decade."²⁹¹ Based upon the significant increases in the FY 1992 and FY 1993 solar energy budgets, it appears President Bush's National Energy Strategy is more "pro-solar" than "embarrassment."

6.3 Solar Energy Legislation During The 101st Congress

Important solar energy legislation enacted by the 101st Congress (1989-90) includes the Omnibus Budget Reconciliation Act of 1989,²⁹² the Renewable Energy and Energy Efficiency Technology Competitiveness Act of 1989,²⁹³ the Solar, Wind, Waste and Geothermal Power Production Incentives Act of 1990,²⁹⁴ the Clean Air Act Amendments of 1990,²⁹⁵ and the Omnibus Budget Reconciliation Act of 1990.²⁹⁶

The Omnibus Budget Reconciliation Act of 1989, once again, saved the

²⁹⁰Lepkowski, supra note 271, at 24.

²⁹¹Interview with Sklar, supra note 74.

²⁹²P.L. 101-239, 103 Stat. 1906 (1989).

²⁹³P.L. 101-218, 103 Stat. 1859 (1989).

²⁹⁴P.L. 101-575, 104 Stat. 2834 (1990).

²⁹⁵P.L. 101-549, 104 Stat. 2399 (1990).

²⁹⁶P.L. 101-508, 104 Stat. 2106 (1990).

solar business investment tax credit at the last minute. The investment tax credit was extended through September 30, 1990.²⁹⁷

By enacting the Renewable Energy and Energy Efficiency Technology Competitiveness Act of 1989, the 101st Congress recognized one of the biggest obstacles to advancement of solar and renewable energy technologies as being unpredictable federal support. This support has been aptly described as varying from abundance to neglect.²⁹⁸ And during the period of neglect, the private sector never compensated for the cutbacks in federal solar energy R&D.²⁹⁹

The purpose of this act is to pursue an aggressive program to accelerate the commercial development of renewable energy sources and energy conservation technologies,³⁰⁰ even if such legislation is a departure from current federal solar energy policy.³⁰¹ In order to achieve the goals of the act, it provides for stable three year authorizations for both the renewable energy³⁰² and energy conservation R&D programs.³⁰³ It also authorizes the Secretary of Energy to enter

²⁹⁷P.L. 101-239, Title VII, § 7106, 103 Stat. 2306 (1989), amending Internal Revenue Code § 46(b), 26 U.S.C. § 46(b)(2)(A).

²⁹⁸H.R. Rep. No. 308(I), 101st Cong., 1st Sess. 11, reprinted in 1989 U.S. Code Cong. & Ad. News 1302, 1305.

²⁹⁹Id. at 1316.

³⁰⁰P.L. 101-218, § 2, 103 Stat. 1859 (1989), 42 U.S.C. § 12001(b).

³⁰¹H.R. Rep. No. 308(II), 101st Cong., 1st Sess. 8, reprinted in 1989 U.S. Code Cong. & Ad. News 1302, 1313.

³⁰²P.L. 101-218, § 4, 103 Stat. 1860 (1989), 42 U.S.C. § 12003(c).

³⁰³P.L. 101-218, § 5, 103 Stat. 1862 (1989), 42 U.S.C. § 12004.

into joint ventures to develop commercial applications for photovoltaics, wind energy, solar thermal and other technologies.³⁰⁴ And it provides greater support for the Department of Energy's international programs which promote the export of domestic solar and renewable energy technology.³⁰⁵

The Solar, Wind, Waste and Geothermal Power Production Incentives Act of 1990 removes the "qualifying facility" (QF) size limitations on solar energy and geothermal small power production facilities under PURPA.³⁰⁶ Being a qualifying facility is extremely important for two reasons - (1) a QF can receive a guarantee that the local utility will purchase its power and interconnect the QF to the local grid, and (2) the QF receives an exemption from regulation as a utility under federal and state law. Prior to this act, solar energy resource QFs were required to be 80 MW or smaller to qualify for the purchase and interconnection benefit, but no larger than 30 MW for the regulatory exemption.³⁰⁷ It is expected that removal of the QF size restrictions will accelerate the growth of solar energy power production facilities which would, in turn, make the energy produced less expensive.³⁰⁸

The Clean Air Act Amendments of 1990 (CAAA) are of interest to the

³⁰⁴P.L. 101-218, § 6, 103 Stat. 1863 (1989), 42 U.S.C. § 12005.

³⁰⁵P.L. 101-218, § 9, 103 Stat. 1868 (1989), 42 U.S.C. § 12006(b)(3)(B).

³⁰⁶P.L. 101-575, § 2, 104 Stat. 2834 (1990), 16 U.S.C. § 824a-3(e)(2).

³⁰⁷H.R. Rep. No. 885, 101st Cong., 2d Sess. 1-2, reprinted in 1990 U.S. Code Cong. & Ad. News 4026, 4026-27.

³⁰⁸Id. at 4028.

solar energy industry. In order to mitigate acid rain, the CAAA includes a sulfur dioxide (SO₂) allowance program for new and existing utilities.³⁰⁹ Under this program, a "dirty" utility who needs to emit more SO₂ than permitted under the program may purchase extra allowances from "cleaner" utilities.³¹⁰ Solar energy advocates believe this will encourage new facilities to utilize solar and other renewable energy sources.³¹¹

In addition, the CAAA requires the Federal Energy Regulatory Commission to calculate the net environmental benefits of solar energy and other renewables compared to nonrenewable energy. Based on this analysis, FERC will assign values to each technology.³¹² These values will be used by the states in establishing a utility rate base which, in turn, could encourage the increased use of solar energy technologies.³¹³

With the enactment of the Omnibus Budget Reconciliation Act of 1990, the solar business investment tax credit was extended through December 31, 1991.³¹⁴ The residential tax credit, which had expired almost five years earlier, was repealed.³¹⁵

³⁰⁹P.L. 101-549, Title IV, § 403, 104 Stat. 2589 (1990).

³¹⁰Id.

³¹¹Sklar, Executive Director's Report, 1 Solar Industry J. 3 (Issue 4 1990).

³¹²P.L. 101-549, Title VIII, § 808, 104 Stat. 2690 (1990), 42 U.S.C. § 7171.

³¹³Sklar, supra note 313.

³¹⁴P.L. 101-508, Title XI, § 11406, 104 Stat. 1388-474 (1990), amending Internal Revenue Code § 46(b), 26 U.S.C. § 46(b)(2)(A).

³¹⁵P.L. 101-508, Title XI, § 11801(a)(1), 104 Stat. 1388-520 (1990), repealing Internal Revenue Code § 23, 26 U.S.C. § 23 [Renumbered § 23 by P.L. 98-369, Div. A, Title IV, § 471(c), 98 Stat. 826 (1984)].

6.4 Solar Energy Legislation During The 102nd Congress

The 102nd Congress (1991-92) started slowly by enacting the Tax Extension Act of 1991.³¹⁶ With less than a month before the solar business investment tax credit expired, it was extended to June 30, 1992.³¹⁷ It turned out, however, the 102nd Congress was saving its best for solar energy until the very end of the Second Session.

The Energy Policy Act of 1992³¹⁸ was enacted on October 24, 1992. Its purpose is to (1) reduce oil imports; (2) conserve energy and use it efficiently; (3) increase the competition between solar (and other renewable) energy technologies and other conventional energy sources; (4) increase the strategic oil reserves; (5) address greenhouse global warming; and (6) implement solutions for nuclear waste and uranium enrichment problems.³¹⁹

And just as the 93rd Congress was inspired to action by an energy crisis,³²⁰ so was the 102nd. With the invasion of Kuwait by Iraq, an embargo ensued of both Kuwaiti and Iraqi oil. This embargo more than

³¹⁶P.L. 102-227, 105 Stat. 1686 (1991).

³¹⁷P.L. 102-227, Title I, § 106, 105 Stat. 1687 (1991), amending Internal Revenue Code § 48(a), 26 U.S.C. § 48(a).

³¹⁸P.L. 102-486, 106 Stat. 2776 (1992).

³¹⁹H.R. Rep. No. 474(I), 102d Cong., 2d Sess. 132, reprinted in 1992 U.S. Code Cong. & Ad. News 1953, 1955 (December 1992).

³²⁰The 1973 OPEC oil embargo.

doubled oil prices³²¹ and was blamed as a major cause of the 1990-92 economic recession by the Bush Administration.³²²

Several provisions of the Energy Policy Act of 1992, such as those dealing with alternative fuels, renewables and global warming, will be of great importance in the advancement of solar energy technologies.

The increased use of alternative fuels such as methanol, ethanol, ethers, natural gas, propane and electricity (all but natural gas and propane can be produced by the solar technologies of biomass and photovoltaics) will significantly reduce the nation's single largest concern, the use of oil by its vehicles. On a daily basis, the nearly 200 million vehicles in the United States consume a volume of fuel equal to one-seventh of the world's oil production.³²³

There are five major alternative fuel provisions. The first requires the federal government to purchase alternative fuel vehicles. In 1993, 10% of the vehicles purchased must be capable of using alternative fuels; by 1988, this increases to 50%.³²⁴ The second provision establishes a non-federal fleet purchase program for private, local and state fleets comprised of 10 or more vehicles. This could result in alternative fuel vehicles totalling 20% of the fleet purchased in 2002 and up to 70% by

³²¹At one point exceeding \$40 per barrel. H.R. Rep. No. 474(I), 102d Cong., 2d Sess. 149, reprinted in 1992 U.S. Code Cong. & Ad. News 1953, 1972.

³²²Id.

³²³Id. at 1959.

³²⁴P.L. 102-486, Title III, § 302, 106 Stat. 2868 (1992).

2005.³²⁵ The third is a requirement for marketers of alternative fuels to use it in their own vehicles. For vehicles purchased in model year 1996, 30% must use alternative fuels; by model year 1999 (and beyond), it increases to 90%.³²⁶ Since it is the marketers who stand to profit most from increased use of alternative fuels, Congress decided the marketers should serve as "guinea pigs" for demonstrating the practicality of alternative fuel vehicles.³²⁷ Any marketer who violates the mandate to purchase alternative fuel vehicles is subject to civil penalties.³²⁸ The fourth alternative fuel provision authorizes a commercial demonstration program for electric vehicles.³²⁹ And the fifth provision requires the Secretary of Energy to develop a national plan for achieving 10%

³²⁵P.L. 102-486, Title V, § 507, 106 Stat. 2891 (1992).

³²⁶P.L. 102-486, Title V, § 501, 106 Stat. 2887 (1992).

³²⁷H.R. Rep. No. 474(I), 102d Cong., 2d Sess. 137, reprinted in 1992 U.S. Code Cong. & Ad. News 1953, 1960.

³²⁸P.L. 102-486, Title V, § 512, 106 Stat. 2899 (1992). Forcing private citizens to purchase alternative fuel vehicles appears to raise the issue of a taking of private property. The House Report is silent on this. Senator J. Bennett Johnston, Chairman of the Senate Committee on Energy and Natural Resources, was adamantly opposed to including this provision. Telephone interview with Sam Fowler, staffer with the Senate Committee on Energy and Natural Resources (May 4, 1993). However, the House Committee on Energy and Commerce, chaired by Representative John D. Dingelle, believed this provision would be the "biggest incentive" for making the alternative fuels program a success. Telephone interview with Judy Greenwald, staffer with the House Committee on Energy and Commerce (May 4, 1993). According to a staffer, this provision is not viewed as forcing a person to buy an alternative fuel vehicle. Unless one chooses to purchase a new business vehicle, the statute does not apply. The staffer compared this requirement to limiting a person in his choice of new vehicles to those that meet strict pollution standards. Id. [This could be a classic example of good intentions making bad law!]

³²⁹P.L. 102-486, Title VI, § 611, 106 Stat. 2900 (1992).

alternative fuel use by 2000 and 30% by 2010.³³⁰

In enacting the National Energy Act, Congress recognized that increased use of solar energy technologies will provide environmentally-benign energy, create economic benefits and increase the security of the nation's energy supply.³³¹ The NEA will continue the emphasis of the Renewable Energy and Energy Efficiency Technology Competitiveness Act of 1989 on commercial applications of solar and renewable energy technologies.³³² This will create a balanced federal policy toward solar energy and other renewables, thereby resulting in a more viable solar and renewable energy industry and increased use of these technologies.³³³

Title XII of the Energy Policy Act of 1992 promotes a variety of solar and renewable energy sources and uses. Biomass technology receives a boost from the authorization of five additional joint venture projects on (1) biomass gasification; (2) utility photovoltaic applications; (3) commercial alcohol plants; (4) solar water heaters to displace oil-fired heaters; and (5) wind and photovoltaic systems to displace diesel

³³⁰P.L. 102-486, Title V, § 502, 106 Stat. (1992).

³³¹H.R. Rep. No. 474(I), 102d Cong., 2d Sess. 1968, reprinted in 1992 U.S. Code Cong. & Ad. News 1953, 1968.

³³²Id.

³³³Past federal policy toward solar energy was unpredictable and unbalanced. Inadequate emphasis by the federal government on commercial applications caused too many financial hardships on the private sector. For example, while 355 megawatts of solar thermal electric capacity are on-line, the company that installed the plants has gone bankrupt. Id.

oil-generated electricity applications.³³⁴ Another program establishes renewable energy export technology training.³³⁵ This program will train technicians from developing countries in the operation and maintenance of American renewable energy equipment.³³⁶

In order to facilitate the growth of nonconventional powerplants, the Energy Policy Act of 1992 creates a renewable energy production incentive. Under this plan, owners of solar and renewable energy powerplants built within ten years of enactment can receive a rebate up to 2.5 cents per kilowatt hour produced.³³⁷ The production incentive does not apply to those who elect to take advantage of the solar business investment tax credit.³³⁸

Other provisions of Title XII include a technology transfer program to increase the export of renewable energy equipment,³³⁹ and monetary awards given by the Department of Energy for technical achievements in the production and commercialization of renewable energy technologies.³⁴⁰

Concerns about global warming caused by greenhouse gas emissions are increasing and the Energy Policy Act of 1992 addresses this issue. Not

³³⁴P.L. 102-486, Title XII, § 1202, 106 Stat. 2956 (1992).

³³⁵P.L. 102-486, Title XII, § 1203, 106 Stat. 2961 (1992).

³³⁶H.R. Rep. No. 474(I), 102d Cong., 2d Sess. 209, reprinted in 1992 U.S. Code Cong. & Ad. News 1953, 2032.

³³⁷P.L. 102-486, Title XII, § 1212, 106 Stat. 2969 (1992).

³³⁸H.R. Rep. No. 474(I), 102d Cong., 2d Sess. 209, reprinted in 1992 U.S. Code Cong. & Ad. News 1953, 2032.

³³⁹P.L. 102-486, Title XII, § 1211, 106 Stat. 2965 (1992).

³⁴⁰P.L. 102-486, Title XII, § 1204, 106 Stat. 2961 (1992).

later than two years after enactment, the Secretary of Energy must submit a report to Congress assessing the feasibility³⁴¹ of stabilizing the generation of greenhouse gases by 2005.³⁴² This report may focus attention on the increased use of solar energy technologies as a solution to curb greenhouse gas emissions. Solar photovoltaic applications appear especially promising.³⁴³

The Energy Policy Act of 1992 finally put to rest the "on again, off again" status of the solar business investment tax credit. As already seen, the tax credit was usually extended at "the eleventh hour."³⁴⁴ The 102nd Congress answers this question by making the 10% solar business investment tax credit a permanent fixture of solar energy policy.³⁴⁵ By making the tax credit permanent, potential investors in long-term projects will have an additional degree of security as to its availability.³⁴⁶

³⁴¹Including economic, energy, social, environmental and competitiveness implications.

³⁴²And reducing 1988 levels of CO₂ by 20%. P.L. 102-486, Title XVI, § 1601, 106 Stat. 2999 (1992).

³⁴³A 1989 Department of Energy study found that photovoltaic powerplants produce less carbon dioxide (a greenhouse gas) emissions than any type of conventional powerplant. Sklar, supra note 10, at 126.

³⁴⁴By the time the ESA was enacted, the solar business investment tax credit should have expired, but it was retroactively extended under the National Energy Strategy. Sklar, Executive Director's Report, 3 Solar Industry J. 3, 3 (Issue 3 1992).

³⁴⁵P.L. 102-486, Title XIX, § 1916, 106 Stat. 3024 (1992), amending Internal Revenue Code § 48(a), 26 U.S.C. § 48(a).

³⁴⁶H.R. Rep. No. 474(IV), 102d Cong., 2d Sess. 47, reprinted in 1992 U.S. Code Cong. & Ad. News 1953, 2258.

6.5 Solar Energy Status At The End Of The Bush Administration

Initially, it appeared as if President Bush's campaign pledge to carry on the policies of the Reagan Administration would doom the solar energy movement to more federal indifference. In actuality, however, the rebirth of the solar energy movement occurred under his Administration.

At the time of his election, the federal solar energy R&D budget was at its lowest point since FY 1975. Yet by the end of four years, the solar budget had increased by 94% from FY 1989 (the last solar budget under the Reagan Administration). A pro-solar attitude had been reborn. This change in attitude was demonstrated by the 101st Congress enacting more solar energy legislation in its first six months than had been seen in the previous decade.³⁴⁷

The solar energy movement was no longer on life support. And while the federal solar budget had a long way to go before reclaiming its lofty status at the end of the Carter Administration, solar advocates were very optimistic. However, beneath this optimism was the realization that federal support for solar energy could change at any time with the election of a new President.

³⁴⁷ Sklar, supra note 10, at 122.

Chapter 7

CONCLUSION

In 1990, the United States consumed 83.7 quads of energy.³⁴⁸ Of this total, solar energy technologies provided approximately 2.4 quads or 2.9%.³⁴⁹ This was a decrease from 1988 when solar energy provided 4% of the nation's energy needs.³⁵⁰

By 1992, solar energy sources contributed approximately 3.4 quads or 4% to the nation's energy supply.³⁵¹ This represents a significant increase over 1990. By far, the leading solar technology was biomass.³⁵²

Based upon these figures, it is doubtful that solar and other renewable energy sources will provide 20% of the nation's energy needs by 2000.³⁵³ However, one should not judge the potential of solar energy based on its past performance. For over eight years, the federal solar energy program had atrophied under the Reagan Administration and it may

³⁴⁸Energy Facts, 3 Solar Industry J. 8 (Issue 3 1992).

³⁴⁹Id.

³⁵⁰Renewable Energy for the World, supra note 240, at 5.

³⁵¹In 1992, the United States required 85 quads. Sissine, Renewable Energy: A New National Energy Commitment?, Congressional Research Service 1, 1 (April 27, 1993).

³⁵²Biomass supplied about 3% of the annual energy needs with all other solar technologies combined providing less than 1%. The most important renewable energy source was hydropower, which supplied 5%. Id.

³⁵³The goal adopted by the Carter Administration. In fact, current projections are for all renewable energy sources to provide only 10% of the nation's total energy demand by 2010. Id.

take several years for the damage to be undone. Certainly, the legislation enacted by the 101st and 102nd Congress is a step in the right direction.³⁵⁴ And though solar energy is not yet a major energy producer, its potential as the nation's most abundant energy source is staggering.³⁵⁵

By 2030, it is estimated that energy consumption by the United States will increase to 144 quads.³⁵⁶ With the renewed emphasis on solar energy by the federal government, solar technologies could constitute a significant percentage of this total. However, as has already been readily established by the history of the federal government's involvement in solar energy, support for it runs hot and cold.

With the election of President Clinton on November 20, 1992, it appears as if solar energy advocates have good reason to be optimistic about the future of federal support for solar R&D. This optimism is based on Clinton's emphasis during his campaign on a national energy strategy structured on the triad of natural gas, energy efficiency and renewables.³⁵⁷

In order to expand the use of all solar and other renewable energy

³⁵⁴As evidenced by the 1992 solar energy data.

³⁵⁵Renewable energy sources account for 93% of the United States' total energy resource base. Renewable Energy for the World, supra note 240, at 4.

³⁵⁶Id. at 5.

³⁵⁷Telephone Interview with Alia Ghandour, Solar Energy Industries Association (April 7, 1993).

sources, President Clinton favors (1) creation of a civilian research agency to support renewable energy R&D; (2) moving the mission of the hundreds of national laboratories from defense R&D to commercial applications of renewables; (3) greater tax incentives for use of renewable energy; (4) giving financial incentives to utilities to adopt "least cost planning" (which factors environmental costs into fuel-use decisions); and (5) decreased reliance on nuclear power.³⁵⁸

Further, when (then candidate) Clinton discussed his vision for a national energy policy at Drexel University on Earth Day, April 22, 1992, his comments were pro-solar. He stated "[t]here's no reason why 60% of the Department of Energy's money should still be going to nuclear weapons, with nuclear power and fossil fuels getting most of the rest. We'll encourage the use of new sources like wind and solar."³⁵⁹

Some "solar romantics" view utilization of solar energy technologies as the "cure-all" for the nation's energy ills. Their unique "Age of Aquarius" view is that "the arrival of the solar age will signal the triumph of democracy, the accommodation of local self-determination, the fulfillment of the virtues of material simplicity and personal self-reliance, and the emergence of a universal commitment to ecological harmony."³⁶⁰ While this "solar utopia" may never reach fruition, there

³⁵⁸Sklar, supra note 346, at 3.

³⁵⁹Energy Facts, supra note 350.

³⁶⁰Byrne and Rich, The Solar Energy Transition as a Problem of Political Economy, The Solar Energy Transition 1, 164-65 (1983).

is no doubt that increased reliance by the United States on solar energy and other renewables will result in less dependence on foreign oil. That in itself justifies more federal involvement in the development of solar energy technologies. However, there is even a more important benefit - the reduction of pollutant emissions.

The emissions resulting from electric power generation using fossil fuel is staggering when compared to solar energy sources that can produce the same power.³⁶¹ The chart below depicts comparative emissions of carbon dioxide (CO₂), nitrogen oxides (NO_x), sulfur oxides (SO_x), total suspended particulates (TSP), carbon monoxide (CO) and hydrocarbons (HC). As can be readily ascertained, solar energy sources are a better environmental choice for electricity production.³⁶² In fact, solar and other renewable energy technologies have reduced the nation's CO₂ production, the primary global warming gas, by 550 million tons per year.³⁶³

³⁶¹Renewable Energy for the World, *supra* note 240, at 10.

³⁶²This conclusion is based on the entire "environmental cost" which includes resource/fuel extraction, facility construction, and plant operation. Energy System Emissions and Materiel Requirements. U.S. Department of Energy 1, 25-29 (February 1989). For example, a 1989 Department of Energy study found that (1) photovoltaic powerplants produced the least emissions of any conventional powerplant; (2) photovoltaic powerplants use the same land area as conventional powerplants; and (3) photovoltaic powerplants use at least one-third less water than conventional powerplants. Sklar, *supra* note 10, at 125.

³⁶³An amount equivalent to the annual output of 138 coal-fired powerplants. Energy Facts, 1 Solar Industry J. 18 (Issue 4 1990).

EMISSIONS OF POLLUTANTS
FROM ELECTRIC POWER GENERATION³⁶⁴
(In tons per gigawatt hour)

<u>Energy Source</u>	<u>CO2</u>	<u>NOx</u>	<u>SOx</u>	<u>TSP</u>	<u>CO</u>	<u>HC</u>
Coal	1058.191	2.986	2.971	1.626	0.267	0.102
Boiling Water Nuclear	8.590	0.034	0.029	0.003	0.001	0.001
Photovoltaic	5.890	0.008	0.023	0.017	0.003	0.002
Biomass	0	0.614	0.154	0.512	11.361	0.768
Wind	7.40	Trace	Trace	Trace	Trace	Trace
Solar Thermal	3.60	Trace	Trace	Trace	Trace	Trace
Geothermal	56.8	Trace	Trace	Trace	Trace	Trace
Hydropower	6.55	Trace	Trace	Trace	Trace	Trace

Clearly, it makes sense to utilize as many solar energy technologies as feasible. However, for solar energy to become a viable alternative to fossil fuels, three obstacles must be overcome. First, there must be a loud, honest endorsement of solar energy by the nation's decision-makers.³⁶⁵ Second, solar energy must overcome its perception as a new technology, as anything new is perceived as exotic.³⁶⁶ And third, people must be convinced that use of solar technology is cost

³⁶⁴Energy System Emissions and Materiel Requirements, supra note 364, at 25-29.

³⁶⁵Interview with Sklar, supra note 74.

³⁶⁶Meredith, Solar Energy Education, Assessment of Solar Energy Technologies 53, 54 (n.d.).

competitive.³⁶⁷

The first obstacle, for now, has been overcome. Federal funding for solar energy R&D is increasing³⁶⁸ and the Clinton Administration appears to recognize the importance of solar energy technologies in national energy policy. Likewise, the increased commitment of the federal government in support of R&D will make solar energy systems more cost competitive. Federal solar energy programs will create more incentives for the private sector to commercialize solar energy applications in a broader range. This should reduce the high initial capital costs of installing a solar energy system.

Education may be the key to acceptance of solar energy by the public and government alike. If the public has the facts on how cost-competitive solar energy technologies can be, they will become more receptive to personal use of this energy source. Even more important, perhaps, is the public "must be made aware that the energy crisis of the 70's has evolved into the environmental crisis of the 90's."³⁶⁹ The "bottom line" is that an "informed public can be a strong and supportive ally in moving a democratic nation³⁷⁰ toward a sustainable energy future."³⁷¹

³⁶⁷The initial high capital costs of solar energy systems (such as a solar water heater versus natural gas-powered) mistakenly cause many people to assume solar alternatives are a poor economic choice. Id.

³⁶⁸By FY 1995, it is expected the federal solar energy R&D budget will be equivalent to FY 1981's. Id.

³⁶⁹Meredith, supra note 368, at 54.

³⁷⁰By electing representatives who recognize the importance of solar energy and other renewables.

³⁷¹Id.

The United States has forgotten many of the lessons learned from the 1973 OPEC oil embargo. Oil imports continue to rise, conservation of energy is not practiced extensively, and more powerful cars with bigger thirsts for gasoline are being produced. Most likely, this amnesia was caused by the policies of the Reagan Administration. It not only delivered an acute blow to the federal solar energy program, but also may have undermined the confidence of the American people in solar technologies.³⁷²

Unless the United States becomes serious about solar energy, the nation is subject to the same economic blackmail as it experienced during the OPEC oil embargo. These words spoken by President Carter in 1980 are just as relevant today.³⁷³

No foreign cartel can set the price of sun power; no one can control it. Every solar collector in this country, every investment in using wind or biomass energy, every advance in making electricity directly from the sun, decreases our reliance on uncertain sources of imported oil, bolsters our international trade position, and enhances the security of our nation.

It appears as if the Clinton Administration may have as great of an impact on the development of solar energy technologies as did the Reagan Administration. However, it should be a positive one. In fact, early indications are that the FY 1994 solar energy R&D budget will have major

³⁷²Interview with Sklar, supra note 74.

³⁷³S. Rep. No. 166, 96th Cong., 2d Sess. 38, reprinted in 1980 U.S. Code Cong. & Ad. News 1743, 1788.

increases over FY 1993. In April 1993, the Department of Energy submitted a solar budget request totalling \$274 million,³⁷⁴ an increase of \$87 million. The solar energy industry will attempt to increase the FY 1994 solar budget even more.³⁷⁵ Unfortunately, with budget cuts currently being such a high priority, it is too early to predict how significant the solar energy R&D budget will be for FY 1994 and succeeding years.³⁷⁶

During the Clinton Administration, solar energy could emerge as a viable energy alternative. However, it will require a serious commitment by the federal government. In order to make any real advances, solar energy R&D will have to be funded as aggressively (and even more so) as that which occurred under the Carter Administration.

It may not be too late to just say "yes" to solar energy.

³⁷⁴Sissine, supra note 353, at 1.

³⁷⁵The solar energy industry recommends a FY 1994 budget of \$534 million. Id.

³⁷⁶Telephone Interview with Alia Ghandour, supra note 359.